INSTALLATION AND OPERATION MANUAL

Airmux-400

Broadband Wireless Multiplexer

Version 2.1

AIRMUX

RAD

data communications

The Access Company

Airmux-400

Broadband Wireless Multiplexer

Version 2.1

Installation and Operation Manual

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For further information contact RAD at the address below or contact your local distributor.

International Headquarters
RAD Data Communications Ltd.

24 Raoul Wallenberg Street
Tel Aviv 69719, Israel
Tel: 972-3-6458181
Fax: 972-3-6498250, 6474436
E-mail: market@rad.com

North America Headquarters
RAD Data Communications Inc.

900 Corporate Drive
Mahwah, NJ 07430, USA
Tel: (201) 5291100, Toll free: 1-800-4447234
Fax: (201) 5295777
E-mail: market@radusa.com

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RAD warrants to DISTRIBUTOR that the hardware in the Airmux-400 to be delivered hereunder shall be free of defects in material and workmanship under normal use and service for a period of twelve (12) months following the date of shipment to DISTRIBUTOR.

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Product Disposal

To facilitate the reuse, recycling and other forms of recovery of waste equipment in protecting the environment, the owner of this RAD product is required to refrain from disposing of this product as unsorted municipal waste at the end of its life cycle. Upon termination of the unit's use, customers should provide for its collection for reuse, recycling or other form of environmentally conscientious disposal.

General Safety Instructions

The following instructions serve as a general guide for the safe installation and operation of telecommunications products. Additional instructions, if applicable, are included inside the manual.

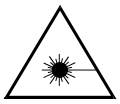
Safety Symbols

Warning

This symbol may appear on the equipment or in the text. It indicates potential safety hazards regarding product operation or maintenance to operator or service personnel.

Danger of electric shock! Avoid any contact with the marked surface while the product is energized or connected to outdoor telecommunication lines.

Protective ground: the marked lug or terminal should be connected to the building protective ground bus.



Warning

Some products may be equipped with a laser diode. In such cases, a label with the laser class and other warnings as applicable will be attached near the optical transmitter. The laser warning symbol may be also attached.

Please observe the following precautions:

- Before turning on the equipment, make sure that the fiber optic cable is intact and is connected to the transmitter.
- Do not attempt to adjust the laser drive current.
- Do not use broken or unterminated fiber-optic cables/connectors or look straight at the laser beam.
- The use of optical devices with the equipment will increase eye hazard.
- Use of controls, adjustments or performing procedures other than those specified herein, may result in hazardous radiation exposure.

ATTENTION: The laser beam may be invisible!

In some cases, the users may insert their own SFP laser transceivers into the product. Users are alerted that RAD cannot be held responsible for any damage that may result if non-compliant transceivers are used. In particular, users are warned to use only agency approved products that comply with the local laser safety regulations for Class 1 laser products.

Always observe standard safety precautions during installation, operation and maintenance of this product. Only qualified and authorized service personnel should carry out adjustment, maintenance or repairs to this product. No installation, adjustment, maintenance or repairs should be performed by either the operator or the user.

Handling Energized Products

General Safety Practices

Do not touch or tamper with the power supply when the power cord is connected. Line voltages may be present inside certain products even when the power switch (if installed) is in the OFF position or a fuse is blown. For DC-powered products, although the voltages levels are usually not hazardous, energy hazards may still exist.

Before working on equipment connected to power lines or telecommunication lines, remove jewelry or any other metallic object that may come into contact with energized parts.

Unless otherwise specified, all products are intended to be grounded during normal use. Grounding is provided by connecting the mains plug to a wall socket with a protective ground terminal. If a ground lug is provided on the product, it should be connected to the protective ground at all times, by a wire with a diameter of 18 AWG or wider. Rack-mounted equipment should be mounted only in grounded racks and cabinets.

Always make the ground connection first and disconnect it last. Do not connect telecommunication cables to ungrounded equipment. Make sure that all other cables are disconnected before disconnecting the ground.

Connecting AC Mains

Make sure that the electrical installation complies with local codes.

Always connect the AC plug to a wall socket with a protective ground.

The maximum permissible current capability of the branch distribution circuit that supplies power to the product is 16A. The circuit breaker in the building installation should have high breaking capacity and must operate at short-circuit current exceeding 35A.

Always connect the power cord first to the equipment and then to the wall socket. If a power switch is provided in the equipment, set it to the OFF position. If the power cord cannot be readily disconnected in case of emergency, make sure that a readily accessible circuit breaker or emergency switch is installed in the building installation.

In cases when the power distribution system is IT type, the switch must disconnect both poles simultaneously.

Connecting DC Power

Unless otherwise specified in the manual, the DC input to the equipment is floating in reference to the ground. Any single pole can be externally grounded.

Due to the high current capability of DC power systems, care should be taken when connecting the DC supply to avoid short-circuits and fire hazards.

DC units should be installed in a restricted access area, i.e. an area where access is authorized only to qualified service and maintenance personnel.

Make sure that the DC power supply is electrically isolated from any AC source and that the installation complies with the local codes.

The maximum permissible current capability of the branch distribution circuit that supplies power to the product is 16A. The circuit breaker in the building installation should have high breaking capacity and must operate at short-circuit current exceeding 35A.

Before connecting the DC supply wires, ensure that power is removed from the DC circuit. Locate the circuit breaker of the panel board that services the equipment and switch it to the OFF position. When connecting the DC supply wires, first connect the ground wire to the corresponding terminal, then the positive pole and last the negative pole. Switch the circuit breaker back to the ON position.

A readily accessible disconnect device that is suitably rated and approved should be incorporated in the building installation.

If the DC power supply is floating, the switch must disconnect both poles simultaneously.

Connecting Data and Telecommunications Cables

Data and telecommunication interfaces are classified according to their safety status.

The following table lists the status of several standard interfaces. If the status of a given port differs from the standard one, a notice will be given in the manual.

Ports	Safety Status	
V.11, V.28, V.35, V.36, RS-530, X.21, 10 BaseT, 100 BaseT, Unbalanced E1, E2, E3, STM, DS-2, DS-3, S-Interface ISDN, Analog voice E&M	SELV	Safety Extra Low Voltage: Ports which do not present a safety hazard. Usually up to 30 VAC or 60 VDC.
xDSL (without feeding voltage), Balanced E1, T1, Sub E1/T1	TNV-1	Telecommunication Network Voltage-1: Ports whose normal operating voltage is within the limits of SELV, on which overvoltages from telecommunications networks are possible.
FXS (Foreign Exchange Subscriber)	TNV-2	Telecommunication Network Voltage-2: Ports whose normal operating voltage exceeds the limits of SELV (usually up to 120 VDC or telephone ringing voltages), on which overvoltages from telecommunication networks are not possible. These ports are not permitted to be directly connected to external telephone and data lines.
FXO (Foreign Exchange Office), xDSL (with feeding voltage), U-Interface ISDN	TNV-3	Telecommunication Network Voltage-3: Ports whose normal operating voltage exceeds the limits of SELV (usually up to 120 VDC or telephone ringing voltages), on which overvoltages from telecommunication networks are possible.

Always connect a given port to a port of the same safety status. If in doubt, seek the assistance of a qualified safety engineer.

Always make sure that the equipment is grounded before connecting telecommunication cables. Do not disconnect the ground connection before disconnecting all telecommunications cables.

Some SELV and non-SELV circuits use the same connectors. Use caution when connecting cables. Extra caution should be exercised during thunderstorms.

When using shielded or coaxial cables, verify that there is a good ground connection at both ends. The grounding and bonding of the ground connections should comply with the local codes.

The telecommunication wiring in the building may be damaged or present a fire hazard in case of contact between exposed external wires and the AC power lines. In order to reduce the risk,

there are restrictions on the diameter of wires in the telecom cables, between the equipment and the mating connectors.

Caution To reduce the risk of fire, use only No. 26 AWG or larger telecommunication line cords.

Attention Pour réduire les risques s'incendie, utiliser seulement des conducteurs de télécommunications 26 AWG ou de section supérieure.

Some ports are suitable for connection to intra-building or non-exposed wiring or cabling only. In such cases, a notice will be given in the installation instructions.

Do not attempt to tamper with any carrier-provided equipment or connection hardware.

Electromagnetic Compatibility (EMC)

The equipment is designed and approved to comply with the electromagnetic regulations of major regulatory bodies. The following instructions may enhance the performance of the equipment and will provide better protection against excessive emission and better immunity against disturbances.

A good ground connection is essential. When installing the equipment in a rack, make sure to remove all traces of paint from the mounting points. Use suitable lock-washers and torque. If an external grounding lug is provided, connect it to the ground bus using braided wire as short as possible.

The equipment is designed to comply with EMC requirements when connecting it with unshielded twisted pair (UTP) cables. However, the use of shielded wires is always recommended, especially for high-rate data. In some cases, when unshielded wires are used, ferrite cores should be installed on certain cables. In such cases, special instructions are provided in the manual.

Disconnect all wires which are not in permanent use, such as cables used for one-time configuration.

The compliance of the equipment with the regulations for conducted emission on the data lines is dependent on the cable quality. The emission is tested for UTP with 80 dB longitudinal conversion loss (LCL).

Unless otherwise specified or described in the manual, TNV-1 and TNV-3 ports provide secondary protection against surges on the data lines. Primary protectors should be provided in the building installation.

The equipment is designed to provide adequate protection against electro-static discharge (ESD). However, it is good working practice to use caution when connecting cables terminated with plastic connectors (without a grounded metal hood, such as flat cables) to sensitive data lines. Before connecting such cables, discharge yourself by touching ground or wear an ESD preventive wrist strap.

FCC-15 User Information

This equipment has been tested and found to comply with the limits of the Class A digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses and can radiate radio frequency energy and, if not installed and used in accordance with the Installation and Operation manual, may cause harmful interference to the radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

Canadian Emission Requirements

This Class A digital apparatus meets all the requirements of the Canadian Interference-Causing Equipment Regulation.

Cet appareil numérique de la classe A respecte toutes les exigences du Règlement sur le matériel brouilleur du Canada.

Warning per EN 55022 (CISPR-22)

Warning	This is a class A product. In a domestic environment, this product may cause radio interference, in which case the user will be required to take adequate measures.
Avertissement	Cet appareil est un appareil de Classe A. Dans un environnement résidentiel, cet appareil peut provoquer des brouillages radioélectriques. Dans ces cas, il peut être demandé à l'utilisateur de prendre les mesures appropriées.
Achtung	Das vorliegende Gerät fällt unter die Funkstörgrenzwertklasse A. In Wohngebieten können beim Betrieb dieses Gerätes Rundfunkströrungen auftreten, für deren Behebung der Benutzer verantwortlich ist.

Mise au rebut du produit

Afin de faciliter la réutilisation, le recyclage ainsi que d'autres formes de récupération d'équipement mis au rebut dans le cadre de la protection de l'environnement, il est demandé au propriétaire de ce produit RAD de ne pas mettre ce dernier au rebut en tant que déchet municipal non trié, une fois que le produit est arrivé en fin de cycle de vie. Le client devrait proposer des solutions de réutilisation, de recyclage ou toute autre forme de mise au rebut de cette unité dans un esprit de protection de l'environnement, lorsqu'il aura fini de l'utiliser.

Instructions générales de sécurité

Les instructions suivantes servent de guide général d'installation et d'opération sécurisées des produits de télécommunications. Des instructions supplémentaires sont éventuellement indiquées dans le manuel.

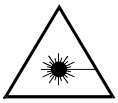
Symboles de sécurité

Avertissement

Ce symbole peut apparaitre sur l'équipement ou dans le texte. Il indique des risques potentiels de sécurité pour l'opérateur ou le personnel de service, quant à l'opération du produit ou à sa maintenance.

Danger de choc électrique ! Evitez tout contact avec la surface marquée tant que le produit est sous tension ou connecté à des lignes externes de télécommunications.

Mise à la terre de protection : la cosse ou la borne marquée devrait être connectée à la prise de terre de protection du bâtiment.



Avertissement

Certains produits peuvent être équipés d'une diode laser. Dans de tels cas, une étiquette indiquant la classe laser ainsi que d'autres avertissements, le cas échéant, sera jointe près du transmetteur optique. Le symbole d'avertissement laser peut aussi être joint.

Veuillez observer les précautions suivantes :

- Avant la mise en marche de l'équipement, assurez-vous que le câble de fibre optique est intact et qu'il est connecté au transmetteur.
- Ne tentez pas d'ajuster le courant de la commande laser.
- N'utilisez pas des câbles ou connecteurs de fibre optique cassés ou sans terminaison et n'observez pas directement un rayon laser.
- L'usage de périphériques optiques avec l'équipement augmentera le risque pour les yeux.
- L'usage de contrôles, ajustages ou procédures autres que celles spécifiées ici pourrait résulter en une dangereuse exposition aux radiations.

ATTENTION : Le rayon laser peut être invisible !

Les utilisateurs pourront, dans certains cas, insérer leurs propres émetteurs-récepteurs Laser SFP dans le produit. Les utilisateurs sont avertis que RAD ne pourra pas être tenue responsable de tout dommage pouvant résulter de l'utilisation d'émetteurs-récepteurs non conformes. Plus particulièrement, les utilisateurs sont avertis de n'utiliser que des produits approuvés par l'agence et conformes à la réglementation locale de sécurité laser pour les produits laser de classe 1.

Respectez toujours les précautions standards de sécurité durant l'installation, l'opération et la maintenance de ce produit. Seul le personnel de service qualifié et autorisé devrait effectuer l'ajustage, la maintenance ou les réparations de ce produit. Aucune opération d'installation, d'ajustage, de maintenance ou de réparation ne devrait être effectuée par l'opérateur ou l'utilisateur.

Manipuler des produits sous tension

Règles générales de sécurité

Ne pas toucher ou altérer l'alimentation en courant lorsque le câble d'alimentation est branché. Des tensions de lignes peuvent être présentes dans certains produits, même lorsque le commutateur (s'il est installé) est en position OFF ou si le fusible est rompu. Pour les produits alimentés par CC, les niveaux de tension ne sont généralement pas dangereux mais des risques de courant peuvent toujours exister.

Avant de travailler sur un équipement connecté aux lignes de tension ou de télécommunications, retirez vos bijoux ou tout autre objet métallique pouvant venir en contact avec les pièces sous tension.

Sauf s'il en est autrement indiqué, tous les produits sont destinés à être mis à la terre durant l'usage normal. La mise à la terre est fournie par la connexion de la fiche principale à une prise murale équipée d'une borne protectrice de mise à la terre. Si une cosse de mise à la terre est fournie avec le produit, elle devrait être connectée à tout moment à une mise à la terre de protection par un conducteur de diamètre 18 AWG ou plus. L'équipement monté en châssis ne devrait être monté que sur des châssis et dans des armoires mises à la terre.

Branchez toujours la mise à la terre en premier et débranchez-la en dernier. Ne branchez pas des câbles de télécommunications à un équipement qui n'est pas mis à la terre. Assurez-vous que tous les autres câbles sont débranchés avant de déconnecter la mise à la terre.

Connexion au courant du secteur

Assurez-vous que l'installation électrique est conforme à la réglementation locale.

Branchez toujours la fiche de secteur à une prise murale équipée d'une borne protectrice de mise à la terre.

La capacité maximale permissible en courant du circuit de distribution de la connexion alimentant le produit est de 16A. Le coupe-circuit dans l'installation du bâtiment devrait avoir une capacité élevée de rupture et devrait fonctionner sur courant de court-circuit dépassant 35A.

Branchez toujours le câble d'alimentation en premier à l'équipement puis à la prise murale. Si un commutateur est fourni avec l'équipement, fixez-le en position OFF. Si le câble d'alimentation ne peut pas être facilement débranché en cas d'urgence, assurez-vous qu'un coupe-circuit ou un disjoncteur d'urgence facilement accessible est installé dans l'installation du bâtiment.

Le disjoncteur devrait déconnecter simultanément les deux pôles si le système de distribution de courant est de type IT.

Connexion d'alimentation CC

Sauf s'il en est autrement spécifié dans le manuel, l'entrée CC de l'équipement est flottante par rapport à la mise à la terre. Tout pôle doit être mis à la terre en externe.

A cause de la capacité de courant des systèmes à alimentation CC, des précautions devraient être prises lors de la connexion de l'alimentation CC pour éviter des courts-circuits et des risques d'incendie.

Les unités CC devraient être installées dans une zone à accès restreint, une zone où l'accès n'est autorisé qu'au personnel qualifié de service et de maintenance.

Assurez-vous que l'alimentation CC est isolée de toute source de courant CA (secteur) et que l'installation est conforme à la réglementation locale.

La capacité maximale permissible en courant du circuit de distribution de la connexion alimentant le produit est de 16A. Le coupe-circuit dans l'installation du bâtiment devrait avoir une capacité élevée de rupture et devrait fonctionner sur courant de court-circuit dépassant 35A.

Avant la connexion des câbles d'alimentation en courant CC, assurez-vous que le circuit CC n'est pas sous tension. Localisez le coupe-circuit dans le tableau desservant l'équipement et fixez-le en position OFF. Lors de la connexion de câbles d'alimentation CC, connectez d'abord le conducteur de mise à la terre à la borne correspondante, puis le pôle positif et en dernier, le pôle négatif. Remettez le coupe-circuit en position ON.

Un disjoncteur facilement accessible, adapté et approuvé devrait être intégré à l'installation du bâtiment.

Le disjoncteur devrait déconnecter simultanément les deux pôles si l'alimentation en courant CC est flottante.

Regulatory Considerations for Radio Sets

In order to protect wireless telecommunication systems, local spectrum authorities may impose restrictions on the use of radio sets. The mains regulatory regimes are those of the European Community, which is governed by the R&TTE Directive, and USA/Canada which is governed by USA CFR Ch. 47 and the equivalent Industry Canada regulations.

European Community

Radio-sets for use within the EU and most other European states are marked by one of the following signs:

CE Mark. Radio-sets marked with this sign alone comply with harmonized standards and use harmonized frequency bands. There is no limitation on their use and they do not require a license.

CE Mark with an exclamation mark. Radio-sets marked with this mark comply with harmonized standards but may use frequency bands which are not fully harmonized in all member countries. Certain spectrum or telecommunications authorities may impose restrictions on their use or require notification on the intention to operate them.

CE Mark with an exclamation mark with a Notified Body number. Same as above, but with the addition of a survey conducted by a Notified Body (an expert opinion on the compliance of the radio-set with the various regulations).

USA and Canada

Radio-sets for use in USA or Canada require certification. They are marked with an FCC Identifier (USA) or a certificate number (Canada).

Quick Start Guide

Installation of Airmux-400 should be carried out only by an experienced technician. If you are familiar with Airmux-400, use this guide to prepare the units for operation.

1. Equipment Required

The following is a list of the equipment and materials required to install Airmux-400 hardware.

- Tools and materials:
  - Crimping tool for RJ-45 (if the ODU-IDU cable is without connectors)
  - Spanner/wrench 13 mm (0.5 in)
  - Drill (for wall mounting only)
  - Cable ties
  - Sealing material
- Cables and connectors:
  - ODU grounding cable 12 AWG
  - IDU grounding cable 18 AWG
  - ODU-IDU cable (outdoor class, CAT-5e, 4 twisted pairs, 24 AWG).

2. Installation Sequence

Install the Airmux-400 system according to the following the steps:

1. Survey the site
2. Mount the ODUs
3. Mount the external antennas (if used)
4. Mount the lightning protection devices (if used)
5. Perform outdoor connections
6. Mount the IDUs
7. Perform indoor connections
8. Align the ODUs/antennas.

3. Installing the Airmux-400 Units

Mounting the ODUs

➤ To mount the ODU on a pole or a wall:

1. Ensure that the ODU is properly grounded.
2. Mount the ODU onto the pole or wall. Ensure that the unit is oriented so that the cable connectors are at the bottom. (If they are on top, water may penetrate into the unit causing damage.)

Notes

- *Do not tighten the ODU to its mounting brackets until the alignment process of the antenna is complete.*
- *Ensure that there are no direct obstructions in front of the ODU or interference from man-made obstacles.*

Mounting an External Antenna

➤ To mount an external antenna:

1. To mount an external antenna ensure that the antenna is properly grounded and then mount the antenna onto the pole.
2. Follow the mounting instructions supplied with the antenna.

Performing Outdoor Connections

➤ To complete the outdoor connections:

1. Connect the ground cable to the ODU chassis as marked on the ODU.
2. Connect the antenna cable(s) to the ODU.
3. Connect the lightning protection device to the ODU.
4. Attach the ODU-IDU cable to the ODU RJ-45 connector.
5. Screw in the cable glands to ensure hermetic sealing of the ODU.
6. Secure the cables to the pole, mast or brackets using UV-rated cable ties.

Mounting and IDU

➤ To mount an IDU:

1. If the rack already holds other equipment, ensure that it is properly grounded.

Warning

Do not proceed with installation into a "live" rack unless it is properly grounded.

2. Attach the rack mounting brackets to the IDU.
3. Bolt the IDU into an empty slot in the rack, ensuring that it sits securely.

4. Ground the IDU to the rack using grounding lug I. The IDU should be left permanently grounded.

Note *Instead of using the rack mounting brackets, the IDU may be rail mounted using the four screw holes on each of its sides.*

Connecting the ODU to the IDU

➤ To connect the ODU to the IDU:

1. Route the cable from the ODU to the IDU, secure the cable along its path
2. Connect the cable to the ODU RJ-45 connector on the IDU.

Connecting User Equipment to the IDU

➤ To connect user equipment to the IDU:

- Connect user switch/router or any other compatible device to the IDU panel RJ-45 ports designated LAN.

Aligning ODUs

➤ To align ODUs with integrated antennas or external bipolar antennas:

1. For external bipolar antennas: Using a coax cable with N-Type connectors, connect the vertical polarization connector of the antenna to the ANT 1 connector of the ODU.
2. For external bipolar antennas: Using a coax cable with N-Type connectors, connect the horizontal polarization connector of the antenna to the ANT 2 connector of the ODU.
3. Ensure that power is connected to the IDUs at both sites.
4. Ensure normal operation of the IDUs by the LED indications on the front panel.
5. Provided that site A detects the signal from site B, the ODU starts beeping 20 seconds after power up, and continues beeping until the ODUs are aligned, and the installation is complete.
6. In the following steps, "antenna" refers both to an external antenna and an integrated antenna.
7. Direct the antenna of site B in the direction of site A. This is simplified if a previous site survey has been completed and azimuths are known.

Warning

When aligning the antennas, do not stand in front of a live antenna.

8. Make a horizontal sweep of 180 degrees with the site A antenna so that the strongest signal from site B can be detected.
9. Slowly turn the site A antenna back towards the position of site B, listening to the tone until the best signal is reached. See the following figure for audible signal variations.

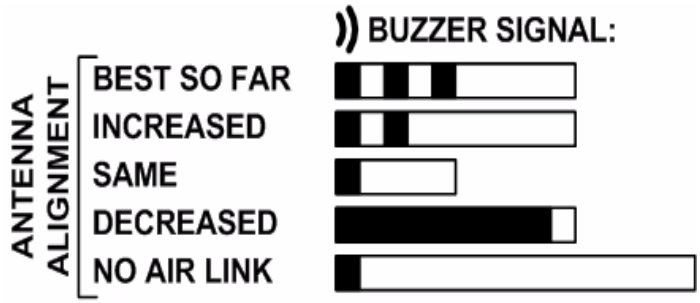


Figure 0-1. Beep Sequence for Antenna Alignment

Note

- *Three beeps and a pause is 'best signal so far'.*
- *Two beeps and a pause is 'signal quality increased'.*
- *One beep and pause is 'no change in signal'.*
- *Long beep and short pause is 'signal quality decreased'.*
- *One beep and a long pause is 'no air link'.*
- *Any other signal does not relate to antenna alignment.*

10. Secure the site A antenna to the pole/wall.
11. Repeat steps 4 to 8 for site B.

➤ To align two external monopolar antennas:

Note *The ODU buzzer only works on the radio connected to the ANT 1 connector marked))). You will therefore need to use ANT 1 to align both antennas in turn. Upon completion of the alignment procedure, you may connect the two antennas to ANT 1 and ANT 2 connectors.*

1. Using a coax cable with N-Type connectors, connect one antenna to the ANT 1 connector of the ODU.
2. Follow the steps 3 to 7 above to align the antenna connected to the ODU connector ANT 1 on both sides of the link.
3. On both sides of the link, disconnect the antenna connected to the ODU connector ANT 1. Connect the other antenna to connector ANT 1 and follow the steps 3 to 7 above to align the second antenna.
4. Secure the antennas to the pole/wall.
5. Restore one of the antennas to ANT 2 on both sides of the link.

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Chapter 1

Introduction

1.1 Overview

Airmux-400 is a carrier-class, full duplex, 50-Mbps capacity, cost-effective multi point-to-point broadband wireless transmission device. It transmits Ethernet traffic over 2.3 to 2.5 GHz and 4.9 to 5.9 GHz bands, and is suitable for deployment in FCC-regulated countries.

Product Options

Airmux-400 is available in several different frequency ranges, with versions for ETSI and FCC regulations;

- 5.725–5.850 (FCC/IC, MII China)
- 5.825–5.875 (WPC India)
- 5.730–5.950 (universal)
- 5.470–5.725 (universal)
- 5.150–5.350 (universal)
- 4.940–4.990 (universal).

Applications

Figure 1-1 illustrates a typical point-to-point application of two Airmux-400 units.

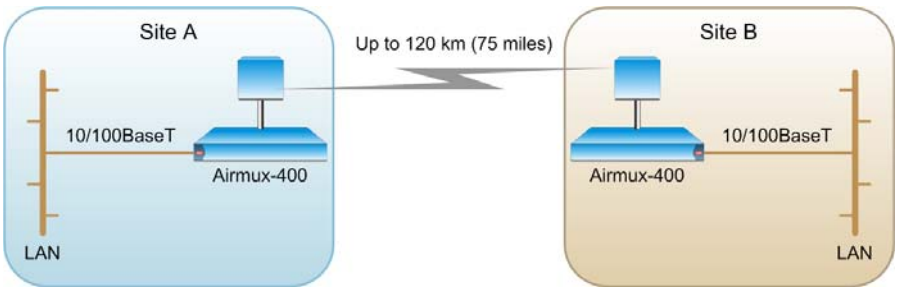


Figure 1-1. Typical Point-to-Point Application

Features

Wireless Link

Airmux-400 delivers up to 50 Mbps air rate for Ethernet traffic. The system supports a variety of spectrum bands.

Using the following technologies, the Airmux-400 air interface is designed to ensure nonstop, high quality transmission, even under interference and harsh conditions

- Automatic Adaptive Rate (AAR) is a mechanism that dynamically adapts the air interface rate by changing both the signal modulation and coding.
- Automatic Channel Selection (ACS) chooses the best channel by monitoring the available radio channels and dynamically selecting a channel which is best suited for transmission at any given time.
- Automatic Repeat Request (ARQ) is a mechanism for error control during data transmission. When the receiver detects an error in the received information, it automatically requests the transmitter to resend the information. This process is repeated until the transmission is error free or the error continues beyond a predetermined number of maximum transmissions. Airmux-400 ARQ mechanism is optimized for time-critical traffic.
- Forward Error Correction (FEC) with very low overhead and algorithms specifically designed for the varying conditions of license-exempt frequency bands, ensuring fast, robust and error-free communications.

LAN Interface

The Airmux-400 LAN port provides 10/100BaseT interfaces with autonegotiation and transparent VLAN support. Traffic handling is provided by a MAC-level self-learning bridge.

Physical Configurations

Airmux multiplexers consist of an outdoor unit (ODU), an optional external antenna and an indoor unit (IDU) with redundant DC power supplies. The outdoor unit is suitable for mast or wall installation.

The collocation feature requires ordering the HSS unit as well as its synchronization cables.

Superior Spectral Efficiency

Built on advanced MIMO and OFDM technologies, the Airmux-400 system provides a high-capacity link at channel bandwidth of 20 MHz. This channel bandwidth supports high robustness of the air interface under interference and harsh conditions. In countries where applicable, narrow channel bandwidth reduces the cost of the spectrum license.

Security

Data transmitted over the air interface is encrypted using Advanced Encryption System (AES) with a 128-bit encryption key.

Adaptive Modulation

Airmux-400 adaptively changes the modulation according to air conditions, targeting maximum rate while maintaining link stability. The rate drops temporarily after encountering interference, then automatically returns to the highest possible rate.

Quality of Service

When the link quality is out of limits, Airmux-400 automatically searches for a clear channel within a pre-selected list of frequencies.

Short Time-to-Service

Because Airmux-400 operates in license-exempt frequencies, it can be deployed in record time, eliminating the costs and delays involved in leasing lines or trenching fiber.

Management

A single SNMP-based network management application (Airmux Manager) is used to control multiple Airmux-400 and Airmux-200 links as a unified network.

VLAN management allows the separation of user traffic from NMS traffic. The user decides if such a separation is required. Both the headquarters and remote sites are configured with VLAN management.

Factory settings can be restored at any time for each ODU.

Information on links and management can be collected and analyzed via a single action.

1.2 Physical Description

An Airmux-400 system may consist of an Outdoor Unit (ODU) and an Indoor Unit or an outdoor PoE, O-PoE, housed in a weather proof enclosure.

Figure 1-3 shows a typical Airmux-400 indoor unit.

Figure 1-2. Airmux-400 Indoor Unit

Functional Description

Airmux-400 system comprises of the following units:

- **Outdoor Unit (ODU)**: An enclosed aluminum frame with a front sealed plastic cover, containing an integrated transceiver with an antenna, RF module, modem and standard interfaces. The ODU stores all the configuration parameters of the Airmux-400 system. *Figure 1-4* shows the ODU block diagram.
- **Indoor Unit (IDU)**: The interface unit between the ODU and the user. It converts 100–240 VAC to -48 VDC, and sends it on to the ODU. The IDU does not store any configuration data. Therefore, there is no need for additional configuration of the Airmux-400 system when replacing an IDU.
- **Outdoor PoE (O-PoE):** An enclosed aluminum frame with a front sealed aluminum cover, containing a 110–220 VAC to 48 VDC switching power supply and an interface interconnecting an un-powered Ethernet infrastructure to ODU.

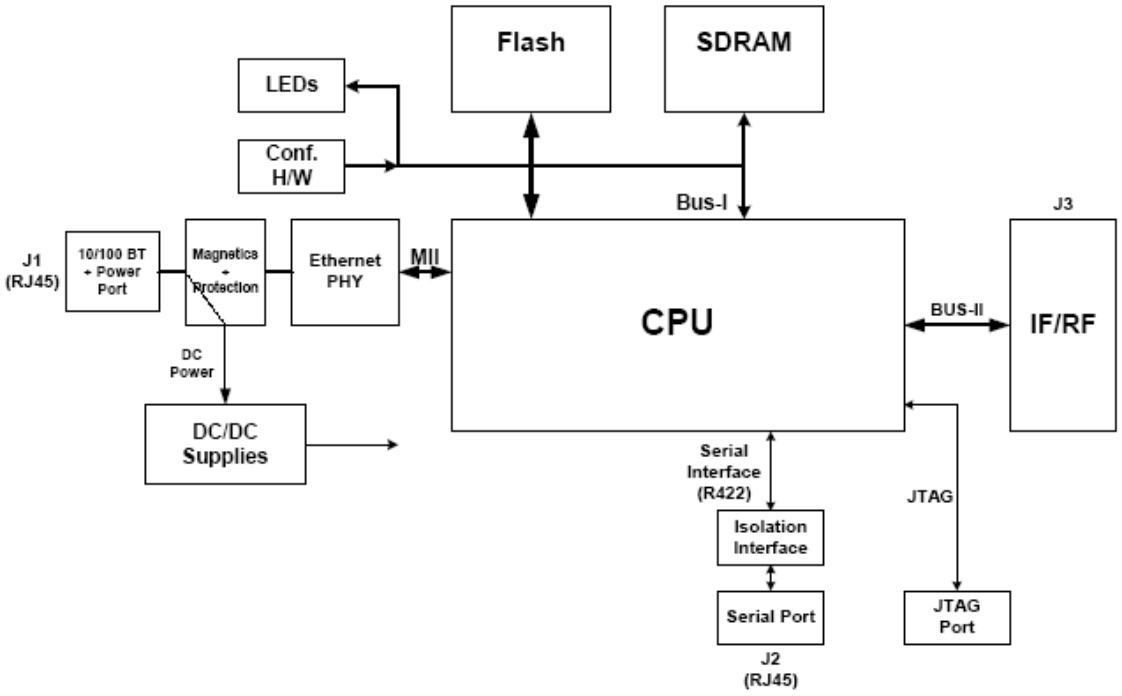


Figure 1-3. ODU Block Diagram

1.3 Technical Specifications

Radio	*Frequency Bands (GHz)*	5.725–5.850 (FCC/IC, MII China) 5.825–5.875 (WPC India) 5.730–5.950 (universal) 5.470–5.725 (universal) 5.150–5.350 (universal) 4.940–4.990 (universal)
	Data Rate	Up to 50 Mbps, full duplex, user-configurable
	Channel Bandwidth	20 MHz
	Duplex Technique	TDD
	Modulation	2×2 MIMO-OFDM (BPSK, QPSK, 16 QAM, 64 QAM), see *Table 1-1*
	Transmit Power	See *Table 1-1*
	Error Correction	FEC, k = 1/2, 2/3, 3/4, 5/6, see *Table 1-1*
	Encryption	AES 128
	Regulation	FCC 47 CFR Part 15 Subpart C IC (Canada) RSS-210 WPC India MII China
Antennas		*Table 1-2*
LAN Interface	*Number of Ports*	2
	Type	10/100BaseT, autonegotiation
	Framing/Coding	IEEE 802.3u
	Bridging	Self-learning, up to 2048 MAC addresses
	Traffic Handling	MAC layer bridging, self-learning
	Latency	3 msec (typical)
	Line Impedance	100Ω
	VLAN Support	Transparent
	Connector	RJ-45

Indicators	*PWR (green)*	Power status (IDU only)
	IDU (green)	IDU-E status
	ODU (green/red)	ODU-to-IDU link status
	AIR I/F (green/red)	Link status
	SVC (green/red)	E1/T1 signal status
Alarm Connector	*Connector*	DB-25 female
	Electrical Characteristics	Dry contact, 30V/2A Max input current, 0.01A at 0.5W (R=5K)
Power	*DC*	-20 to -60 VDC (24 VDC or 48 VDC nominal) via AC/DC converter
	Power Consumption	35W max (ODU with IDU)
	Connector	3-pin terminal block
Physical	*ODU (with integrated antenna)*	Height: 371 mm (14.8 in) Width: 371 mm (14.8 in) Depth: 9 mm (3.6 in) Weight 3.5 kg (7 lb)
	IDU	Height: 45 mm (1.7 in) Width: 436 mm (17.2 in) Depth: 210 mm (8.3 in) Weight 1.5 kg (3.3 lb)
Environment	*Temperature*	ODU: -35°C to +60°C (-31°F to +140°F) IDU: 0°C to +50°C (32°F to +122°F)
	Humidity	ODU: Up to 100% non-condensing, IP67 IDU: Up to 90%, non-condensing

Table 1-1. Radio Link Characteristics

Modulation	Rate (Single Antenna)	Rate (Dual Antenna)	FEC	Max Tx Power
	[Mbps]	[Mbps]	[k =]	[dBm]
BPSK	N/A	13	1/2	22
QPSK	13	26	1/2	22
	19.5	39	3/4	
16 QAM	26	52	1/2	22
	29	78	3/4	
64 QAM	52	104	2/3	20
	58.5	117	3/4	
	65	130	5/6	

Table 1-2. Antenna Options

Antenna Type		Frequency	Gain	Beam	Dimensions		Weight		Connector
		[GHz]	[dBi]	[degrees]	[mm]	[in]	[kg]	[lb]	
Integrated	Flat panel	4.9x–5.875	23	9	371×371×40	1.2×1.2×1.5	2.5	5.5	2 × N-type
External	Dish	5.150–5.875	28	5.6	Diam. 620	Diam. 24.4	20.4	45	2 × N-type

Note

The range of the system depends on the system configuration. For further information, contact the RAD partner nearest you or one of RAD's offices worldwide.

Chapter 2

Installation and Setup

This section describes the installation, alignment, and setup procedures for an Airmux-400 system.

After installing the hardware and establishing a link, refer to *Chapter 3* for operation instructions and *Chapter 4* for configuration instructions.

In case a problem is encountered, refer to *Chapter 5* for test and diagnostic instructions.

Warning

Internal settings, adjustment, maintenance, and repairs may be performed only by a skilled technician who is aware of the hazards involved.

Always observe standard safety precautions during installation, operation, and maintenance of this product.

Note

Before installing the product, review Handling Energized Products at the beginning of the manual.

2.1 Safety Practices

Warning

Outdoor units and antennas should be installed ONLY by experienced installation professionals who are familiar with local building and safety codes and, wherever applicable, are licensed by the appropriate government regulatory authorities. Failure to do so may expose the end user or the service provider to legal and financial liabilities. RAD and its resellers or distributors are not liable for injury, damage or violation of regulations associated with the installation of outdoor units or antennas.

Preventing Overexposure to RF Energy

To protect against overexposure to RF energy, install the ODUs so as to provide and maintain minimal separation distances from all persons.

When the system is operational, avoid standing directly in front of the antenna. Strong RF fields are present when the transmitter is on. The ODU must not be deployed in a location where it is possible for people to stand or walk inadvertently in front of the antenna.

Warning

Do not activate indoors an ODU with an integrated or external antenna. To test an active radio link inside the building, use an attenuated RF cable (at least 40 db) for the ODU connection.

Grounding

All RAD products should be grounded during operation. In addition:

- The ODU should be earthed by a wire with diameter of at least 12 AWG.

  The Airmux-400 ODU must be properly grounded to protect against lightning. It is the user's responsibility to install the equipment in accordance with Section 810 of the National Electric Code, ANSI/NFPA No.70-1984 or Section 54 of the Canadian Electrical Code. These codes describe correct installation procedures for grounding the outdoor unit, mast, lead-in wire and discharge unit. It also lays down the size of grounding conductors and connection requirements for grounding electrodes.

  The Airmux-400 ODU must be grounded to a protective earth as described in *Appendix D* and in accordance with the local electrical regulations.

- The earth lug on the IDUE should be connected to the protective earth at all times, by a wire with a diameter of 18 AWG or wider. Rack-mounted equipment should be mounted only in earthed racks and cabinets.
- Always make the ground connection first and disconnect it last
- Never connect telecommunication cables to ungrounded equipment
- Ensure that all other cables are disconnected before disconnecting the ground.

More detailed grounding guidelines are supplied in *Appendix D*.

Protection against Lightning

The use of lightning protection is dependent on regulatory and end user requirements. All of RAD outdoor units are designed with surge limiting circuits to minimize the risk of damage due to lightning strikes. RAD recommends the use of additional surge arrestor devices to protect the equipment from nearby lightning strikes.

See *Appendix D* for detailed installation instructions of lightning protection devices.

- It is recommended that installation of the outdoor unit be contracted to a professional installer.
- Before working on equipment connected to power lines or telecommunication lines, you should remove jewelry or any other metallic object that may come into contact with energized parts.
- Use extreme care when installing antennas near power lines.
- Use extreme care when working at heights.
- When using an AC power source for Airmux-400 always use the AC power adapter supplied by RAD.
- Use the right tools. In addition to standard tools required for any kind of ODU or antenna installation, Airmux-400 requires additional specific tools detailed in the *Additional Equipment Required* section below.

2.2 Site Requirements and Prerequisites

For the IDU units, allow at least 90 cm (36 in) of frontal clearance for operating and maintenance. Allow at least 10 cm (4 in) clearance at the rear of the unit for signal lines and interface cables.

The ambient operating temperature should be –35° to 60°C (–31° to 140°F) (ODU), or 0° to 50°C (32° to 122°F) (IDU) at a relative humidity of up to 100% (ODU) or 90% (IDU), non-condensing.

2.3 Package Contents

The Airmux-400 packages include the following items:

- ODU package containing:
  - One ODU, see *Figure 2-1*, *Figure 2-2*
  - An ODU mounting kit
  - Label showing the MAC address and the alternative community string. The label is self-adhesive. You should keep this label safe.
  - Cable glands (to be used with the ODU-IDU cable).

Figure 2-1. Connectorized ODU, Front and Rear Views

Figure 2-2. Integrated ODU, Front and Rear Views

- IDU package containing:
  - IDUE
  - 19-inch rack mounting kit
  - Two DC power plugs for power cables.

  Or
- External antenna (if ordered)
  - Antenna
  - RF cable 1m (3 ft) long; two cables supplied with bipolar antennas, single cable supplied with monopolar antennas
  - Mounting kit.

2.4 Additional Equipment Required

The following is a list of the equipment and materials required to install Airmux-400 hardware.

- Tools and materials:
  - Crimping tool for RJ-45 (if the ODU-IDU cable is without connectors)
  - Spanner/wrench 13 mm (0.5 in)
  - Drill (for wall mounting only)
  - Cable ties
  - Sealing material
- Cables and connectors:
  - ODU grounding cable 12 AWG
  - IDU grounding cable 18 AWG
  - ODU-IDU cable (outdoor class, CAT-5e, 4 twisted pairs, 24 AWG).

2.5 Installation Sequence

Install the Airmux-400 system according to the following the steps:

1. Survey the site
2. Mount the ODUs, see *Appendix B*
3. Mount the external antennas (if used), see *Appendix B*
4. Mount the lightning protection devices (if used), see *Appendix D*
5. Perform outdoor connections, see *Outdoor Connections*
6. Mount the IDUs, see *Mounting the IDUs*.
7. Perform indoor connections, *Connecting the ODU to the IDU*.
8. Align the ODUs/antennas, page *Connecting and Aligning ODUs / Antennas*.

Figure 2-3 illustrates a typical installation of Airmux-400 with an external antenna.

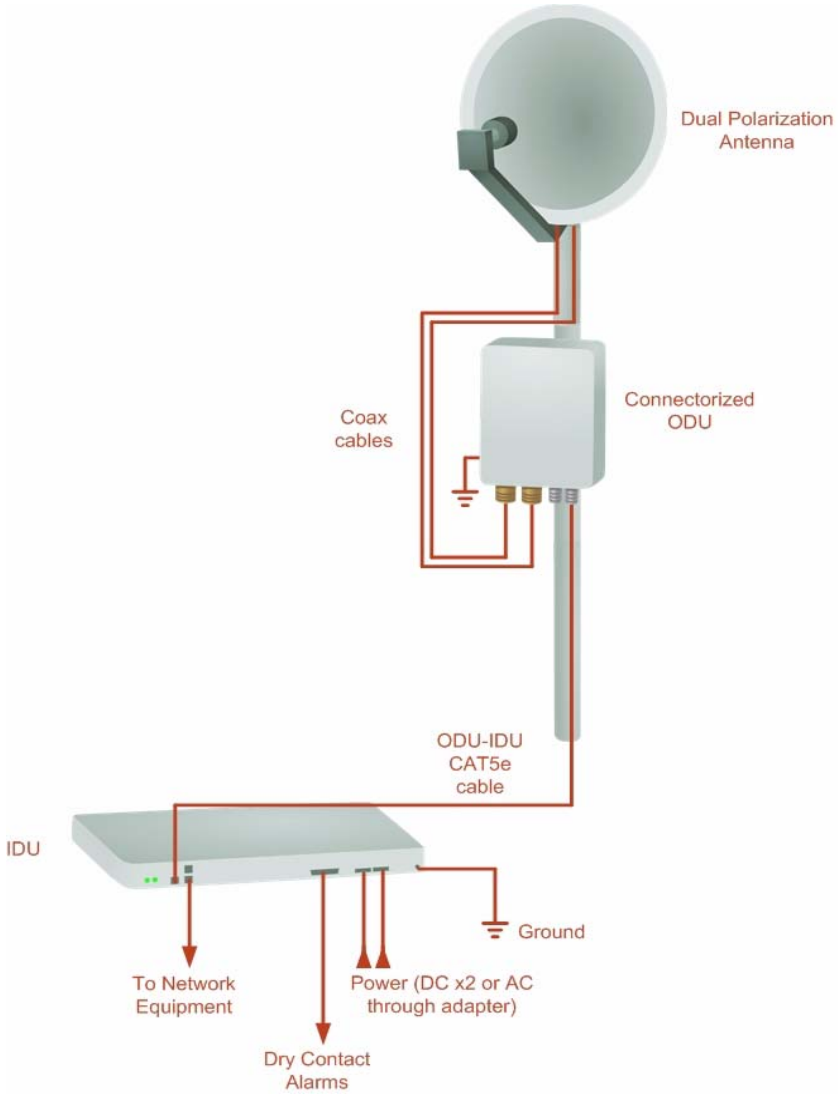


Figure 2-3. Typical Installation Diagram (with External Antenna)

2.6 Surveying the Site

This section explains how to survey the site intended for Airmux-400 installation.

Planning the Link Site

Link site planning consists of a set of surveys, which must be carried out before any equipment is brought to the site. If for some reason, the outcome of any of these surveys is negative, site re-location will need to be considered.

A site survey consists of three stages:

- Preliminary survey – The proposed link is analyzed in the office using a topographic map.
- Physical survey – The locations of the Airmux-400 indoor and outdoor equipment are determined on-site.
- Radio Frequency (RF) survey – It is recommended that the installation area be scanned with a spectrum analyzer, to identify RF interference so as to determine a clear channel for Airmux-400 installation (on-site).

Site Survey

Airmux-400 wireless links must be planned before installation. The designated installation site must be appraised to determine that the wireless system is able to operate efficiently and provide connectivity without signal degradation.

Airmux-400 offers a wide operating frequency range. A free frequency channel must be determined within the operating range, for optimum performance.

Recommended equipment:

- Stage 1 (preliminary survey)
  - Topological map of the area
  - Urban map of the area
  - Compass
- Stage 2 (physical survey)
  - 100 meter tape measure
  - Ohmmeter, to check ground connection
  - Binoculars
  - Map
  - Digital camera
  - Paper, pencil, and a clipboard
  - GPS device (optional)
  - Compass (optional)

- Stage 3 (RF survey)
  - Spectrum analyzer with Max Hold function and screen capture facility that can store multiple images, for documentation purposes
  - RF accessories (connectors and cables)
  - Communication devices (for example, cellular phones, or a set of walkie talkies).

Stage 1 (Preliminary Survey)

A preliminary survey is necessary before visiting potential installation sites. As much detail as possible should be obtained about the two designated ODU installation sites and the area between them.

➤ To perform a preliminary survey:

1. Mark the two designated installation sites on a topographic map of the area.
2. Measure the distance between the sites; check that it is within the specified range of Airmux-400.
3. On the urban map, check for developed areas situated between the two installation sites. Pay attention to these areas when performing the physical site survey; there may be tall buildings, RF towers, or transmitters, which could cause interference to the link.
4. Check the area between the two sites for obstructions such as:
   - High ground - hills or mountains
   - Lakes or large bodies of water. Water has a reflection effect on RF signals like a building. This type of reflection causes the received amplitude to be reduced. As a rule of thumb, the presence of a large body of water between the link sites may double the required antenna height.
5. Determine and record the compass bearings between both ODUs, relative to north.
6. If there are obstructions between the two sites, calculate the Fresnel Zone (see *Appendix C* for details).
7. If the site chosen does not meet requirements, consider alternative sites.
8. Use the Link Budget Calculator (on the CD supplied with Airmux-400 or using the Airmux Manager) to determine the expected performance.

Stage 2 (Physical Survey)

The physical site survey reviews the environment of the proposed Airmux-400 installation location, to ensure that the link sites are suitable for the wireless network. The results of the physical site survey should be recorded.

Note *It is advisable to go on a clear day, so you can more easily see any obstructions between the two sites.*

➤ To perform a physical survey:

1. From the compass readings taken in the preliminary survey, find the azimuth (horizontal position) that the ODU should face towards the second ODU.

2. Using binoculars, locate any obstructions such as tall trees, high buildings, hills or mountains. Look for other RF towers between the two sites. Mark the locations of the obstructions on the map.
3. Determine the location for the ODU (having regard for existing rooftop installations and tower space). It should be above any obstructions, considering the Fresnel zone (see *Appendix C*).
4. If you need to install the ODU on a tower, make sure that the tower is far away from overhead electric power lines.
5. Determine a location for the indoor equipment; it should be as close as possible to the ODU. At an existing site, there is probably an equipment room with cable-routing channels.

Note *The IDU–ODU cable length limit is 100m, in accordance with IEEE 10/100BaseT requirements.*

6. Measure and record the path length of the cable from the ODU position to the indoor equipment room.
7. Determine the ground and lightning connection points of the installation. The AirMux-400 ODU and IDU must both be grounded.
8. Using the ohmmeter, measure and record the resistance of the required installation to the grounding point. The resistance must be less than 1O ohm.
9. Review the results of the physical site survey. Decide if the site is suitable for the AirMux-400 wireless network installation.
   - If the site is suitable, continue with stage 3, the RF survey
   - If the site is not suitable, survey another site.

Stage 3 (RF Survey)

The RF survey examines the wireless environment of the Airmux-400 installation site, to determine whether there are available channels within the Airmux-400 operating frequency band. An RF survey is performed using a spectrum analyzer.

It is advisable to familiarize yourself with the spectrum analyzer before going out on site, specifically the Max Hold and Marker functions.

You should perform the RF survey at both proposed link sites.

The survey should be carried out during a busy time of day, to best judge the worst-case radio interference. Allow 2–4 hours duration for a good RF survey.

Note *It is possible to install the Airmux-400 link and use the Airmux Manager to find a clear channel. Each frequency channel can be evaluated in turn. Achievement of a clear channel is indicated by the Quality bar on the Channel Setting window becoming green.*

2.7 Outdoor Installation

Mounting the ODU

The ODU can be mounted on a pole or a wall. In both installations, the supplied mounting kit is used to secure the ODU.

Note *A mast-sited ODU typically uses a pole attached to the mast.*

An Airmux-400 link operates in pairs of two ODUs with the same configuration. Both ODUs must be installed, and the antennas aligned for maximum throughput.

Warning

Prior to connecting cables to the ODU, the protective earth terminal (screw) of the ODU must be connected to an external protective ground conductor or to a grounded pole.

- **Only a qualified person using the proper safety equipment should climb the antenna mast**
- **Only qualified professional personnel should install or dismantle ODUs and masts.**

➤ **To mount the ODU on a pole or a wall:**

1. Ensure that the ODU is properly grounded.
2. Mount the ODU onto the pole or wall. Ensure that the unit is oriented so that the cable connectors are at the bottom. **(If they are on top, water may penetrate into the unit causing damage.)**
3. Refer to *Appendix B* for detailed ODU mounting kit contents and schematics.

Notes

- *Do not tighten the ODU to its mounting brackets until the alignment process of the antenna is complete.*
- *Ensure that there are no direct obstructions in front of the ODU or interference from man-made obstacles.*

Mounting External Antennas

If you are using ODU with an integrated antenna, skip to *Mounting the Lightning Protection Devices* below.

The supplied mounting kit is used to mount the antenna onto a pole. The antennas must be aligned for maximum throughput.

Warning

Do not stand in front of a live antenna.

➤ **To mount an external antenna:**

1. To mount an external antenna ensure that the antenna is properly grounded and then mount the antenna onto the pole. Refer to *Appendix B* for detailed antenna mounting instructions.
2. Follow the mounting instructions supplied with the antenna.

Mounting the Lightning Protection Devices

The use of lightning protection is dependent on regulatory and end user requirements. The Airmux-400 ODU is designed with surge limiting circuits to minimize the risk of damage due to lightning strikes. RAD recommends the use of additional surge arrestor devices to protect the equipment from nearby lightning strikes.

Refer to *Appendix D* for detailed installation instructions of lightning protection devices.

Outdoor Connections

Connect the outdoor devices once they are installed.

➤ **To complete the outdoor connections:**

1. Connect the ground cable to the ODU chassis as marked on the ODU.
3. Connect the antenna cable(s) to the ODU.
4. Connect the lightning protection device to the ODU (see *Appendix D*).
5. Attach the ODU-IDU cable to the ODU RJ-45 connector (see *Appendix A*)for the connector pinout)
6. Screw in the cable glands to ensure hermetic sealing of the ODU.
7. Secure the cables to the pole, mast or brackets using UV-rated cable ties.

2.8 Indoor Installation

Mounting the IDUs

The Airmux-400 IDUs are all rack mounted. A front panel keyed schematic of a rack mounted IDUE is shown in *Figure 2-4*.

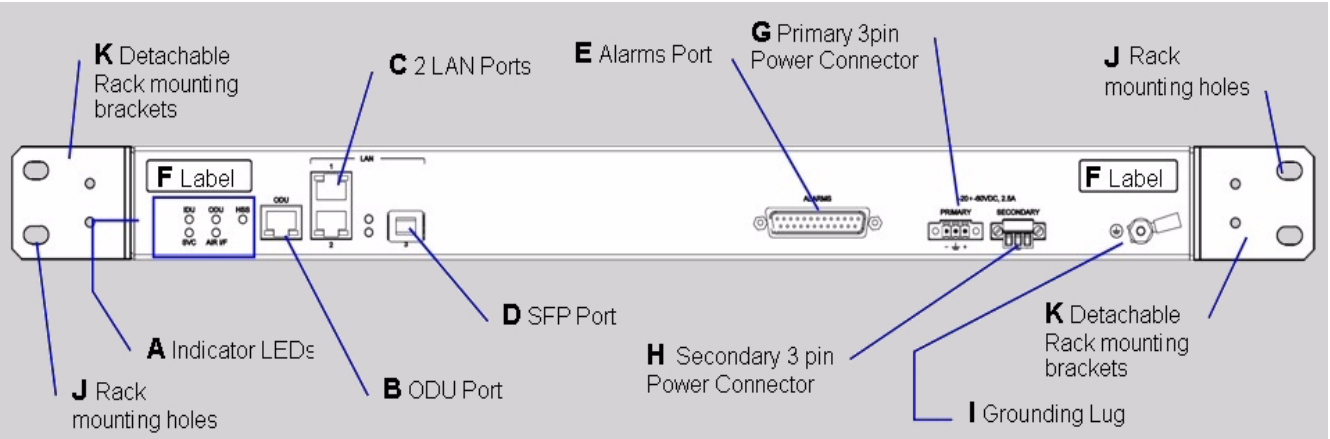


Figure 2-4. IDUE Front Panel

➤ **To mount an IDU:**

1. If the rack already holds other equipment, ensure that it is properly grounded.

Warning

Do not proceed with installation into a "live" rack unless it is properly grounded.

2. Attach the rack mounting brackets (K) to the IDU.
3. Bolt the IDU into an empty slot in the rack, ensuring that it sits securely.
4. Ground the IDU to the rack using grounding lug I. The IDU should be left permanently grounded.

Note *Instead of using the rack mounting brackets, the IDU may be rail mounted using the four screw holes on each of its sides.*

Connecting Power to the IDU

The IDUE has redundant power connection circuits.

The connectors are 3 pin in line female, with polarities (left to right) minus, ground, plus. To avoid damage to the IDU, always use an AC/DC adapter supplied by RAD.

Ensure that the IDUs at both sites are powered up.

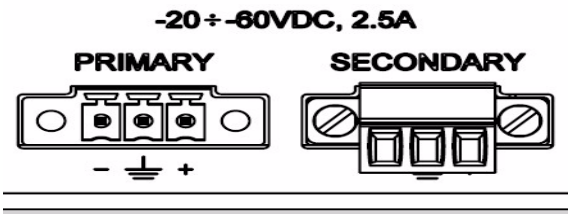


Figure 2-5. IDUE Power Connectors

Connecting the ODU to the IDU

The ODU-IDU cable conducts all the user traffic between the IDU and the ODU, and also provides power to the ODU. The maximum length of the ODU-IDU cable is 100m (328 ft) in accordance with 10/100BaseT standards.

The ODU-IDU cable is supplied pre-assembled with RJ-45 connectors, at the length specified when ordering, or as a cable drum with spare connectors. If the ODU-IDU cable was not ordered, use an outdoor class, CAT-5e 24 AWG shielded cable. See *Appendix A* for wiring specifications.

➤ **To connect the ODU to the IDU:**

1. Route the cable from the ODU to the IDU, secure the cable along its path
2. Connect the cable to the ODU RJ-45 connector on the IDU.

Installing a Link using PoE Devices

The PoE device is a simple unit having a power input connector and two Ethernet ports. It is AC powered, and has a power LED.

➤ **To prepare a link using PoE devices:**

1. To connect the ODU to the PoE device, route the cable from the ODU to the PoE device, secure the cable along its path and connect the cable to the P-LAN-OUT RJ-45 connector on the PoE device.
2. Connect it to AC power.
3. Repeat steps 1 to 2 for the second link.

Connecting User Equipment

➤ **To connect user equipment to the IDU:**

- Connect user switch/router or any other compatible device to the IDU panel RJ-45 ports designated LAN. Refer to *Appendix A*, for connector pinouts.

Note *Do not connect two LAN ports to the same network, or flooding may occur.*

➤ **To connect user equipment to the PoE device:**

- Connect a user switch, router or any other compatible device to the PoE device RJ-45 port designated LAN-IN. Refer to *Appendix A* for connector pinouts.

2.9 Connecting and Aligning ODUs / Antennas

You perform antenna alignment using the ODU's audible tone. To speed up the installation time, alignment of an Airmux-400 system should be performed by two teams simultaneously, at site A and at site B.

➤ **To align ODUs with integrated antennas or external bipolar antennas:**

1. For external bipolar antennas: Using a coax cable with N-Type connectors, connect the vertical polarization connector of the antenna to the ANT 1 connector of the ODU.
2. For external bipolar antennas: Using a coax cable with N-Type connectors, connect the horizontal polarization connector of the antenna to the ANT 2 connector of the ODU.
3. Ensure that power is connected to the IDUs at both sites.
4. Ensure normal operation of the IDUs by the LED indications on the front panel.
5. Provided that site A detects the signal from site B, the ODU starts beeping 20 seconds after power up, and continues beeping until the ODUs are aligned, and the installation is complete.

6. In the following steps, "antenna" refers both to an external antenna and an integrated antenna.
7. Direct the antenna of site B in the direction of site A. This is simplified if a previous site survey has been completed and azimuths are known.

Warning

When aligning the antennas, do not stand in front of a live antenna.

8. Make a horizontal sweep of 180 degrees with the site A antenna so that the strongest signal from site B can be detected.
9. Slowly turn the site A antenna back towards the position of site B, listening to the tone until the best signal is reached. See the following figure for audible signal variations.

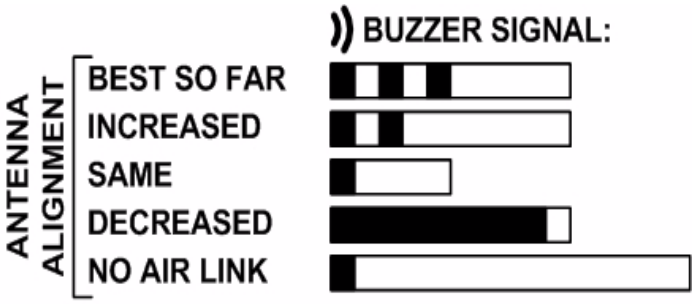


Figure 2-6. Beep Sequence for Antenna Alignment

Note

- *Three beeps and a pause is 'best signal so far'.*
- *Two beeps and a pause is 'signal quality increased'.*
- *One beep and pause is 'no change in signal'.*
- *Long beep and short pause is 'signal quality decreased'.*
- *One beep and a long pause is 'no air link'.*
- *Any other signal does not relate to antenna alignment.*

10. Secure the site A antenna to the pole/wall.
11. Repeat steps 4 to 8 for site B.

➤ **To align two external monopolar antennas:**

Note

The ODU buzzer only works on the radio connected to the ANT 1 connector marked))). You will therefore need to use ANT 1 to align both antennas in turn. Upon completion of the alignment procedure, you may connect the two antennas to ANT 1 and ANT 2 connectors.

1. Using a coax cable with N-Type connectors, connect one antenna to the ANT 1 connector of the ODU.
2. Follow the steps 3 to 7 above to align the antenna connected to the ODU connector ANT 1 on both sides of the link.
3. On both sides of the link, disconnect the antenna connected to the ODU connector ANT 1. Connect the other antenna to connector ANT 1 and follow the steps 3 to 7 above to align the second antenna.

4. Secure the antennas to the pole/wall.
5. Restore one of the antennas to ANT 2 on both sides of the link.

2.10 Working with the Airmux Manager Application

The Airmux Manager application is distributed on a CD. Operating system specific PC resources required by the application are set out in *Table 2-1*.

Table 2-1. PC Requirements for the Airmux Manager Application

	Windows 2000	Windows XP Pro	Windows Vista
Memory	128 MB	512 MB	1 GB
Processor	P III	P IV	P IV Dual Core

Requirements common to all systems are:

- Hard disk: 1 GB free space
- Network: 10/100BaseT NIC
- Graphics: 1024 × 768 screen resolution with 16 bit color
- Microsoft Explorer version 5.01 or later.

Installing the Airmux Manager

➤ To install the Airmux Manager:

1. Insert the CD-ROM into your CD-ROM drive.

   The installation starts automatically.

2. Follow the on-screen instructions of the installation wizard to complete setup of the Airmux Manager program in the desired location.

Starting the Airmux Manager

➤ To start the Airmux Manager:

1. Connect the managing computer to one of the two LAN ports of the IDUE as shown below.

Figure 2-7. LAN Ports on the Front Panel of the IDUE

If you are not using a direct connection as above, ensure that you have IDU to managing computer connectivity (e.g. through a LAN).

2. Check that you have connectivity to the ODU. You can do this by opening up a command line session (**Start>Run** and then type, **cmd**). At the command prompt, type: ping 10.0.0.120

   You should receive a reply from Airmux-400.

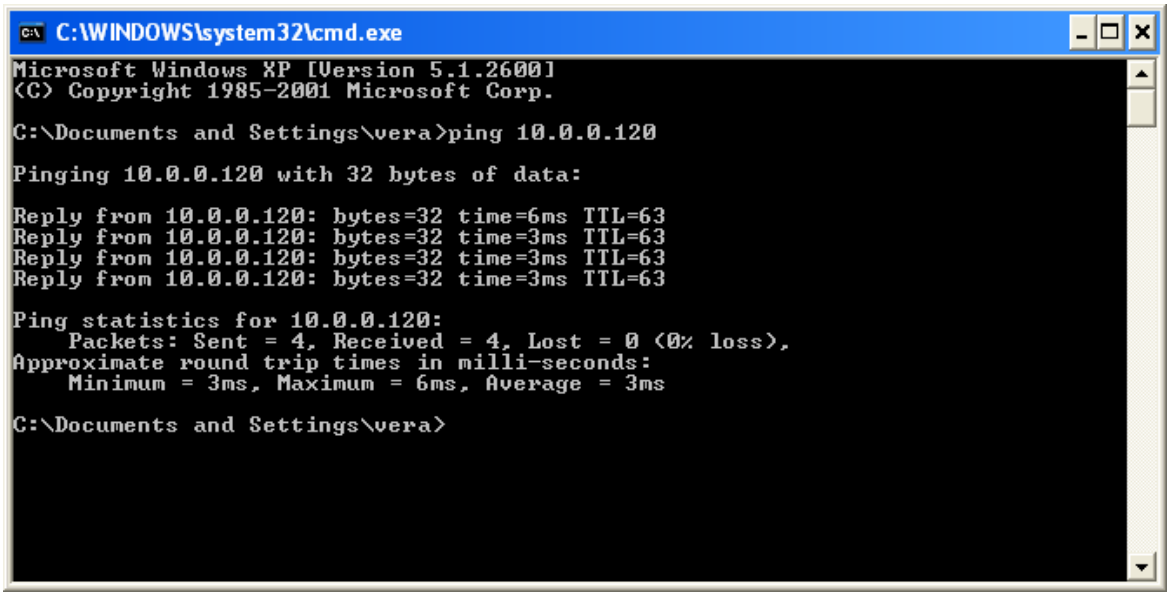

C:\WINDOWS\system32\cmd.exe
Microsoft Windows XP [Version 5.1.2600]
(C) Copyright 1985-2001 Microsoft Corp.
C:\Documents and Settings\vera>ping 10.0.0.120
Pinging 10.0.0.120 with 32 bytes of data:
Reply from 10.0.0.120: bytes=32 time=6ms TTL=63
Reply from 10.0.0.120: bytes=32 time=3ms TTL=63
Reply from 10.0.0.120: bytes=32 time=3ms TTL=63
Reply from 10.0.0.120: bytes=32 time=3ms TTL=63
Ping statistics for 10.0.0.120:
Packets: Sent = 4, Received = 4, Lost = 0 (0% loss),
Approximate round trip times in milli-seconds:
Minimum = 3ms, Maximum = 6ms, Average = 3ms
C:\Documents and Settings\vera>

Figure 2-8. Pinging an Uninstalled and Unconfigured Link

Any other response from ping means that the ODU is not responding. Check your Ethernet connection and that both the IDU and ODU are switched on and then try again.

3. Dismiss the command line session.
4. Double-click the Airmux Manager icon on the desktop, or click Start › Programs › Airmux Manager › Airmux Manager.

   The Login dialog box appears.

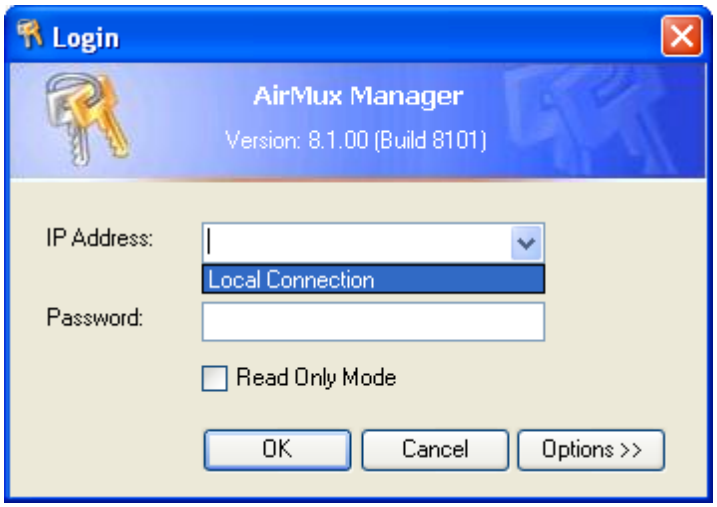


Figure 2-9. Login Screen

5. Type an IP address for the ODU (if you connect through a network), or click Local Connection (if you are connected directly to the IDU port).

Caution

- If you log in on Local Connection, but your physical connection is **not** local (i.e. anything other than a direct connection between the managing computer and the IDU), then any configuration you carry out may affect other links in the network.
- If you log in via an over-the-air IP address, you will receive a warning. If you reset the site to which you are connected to factory settings, you can lock yourself out of the link.
- Network login (IP address to the ODU) is recommended.

Note

The default IP address for the ODU is 10.0.0.120. The subnet mask is 255.0.0.0. The actual IP address is defined during link configuration (see Chapter 4).

6. Enter the password. The default password is ***admin***.
7. If you are a user with Read-Write permission, click **Options** to enter the Community options.
   - If you are using the system for the first time, leave the default Community passwords, ***netman*** for read-write, and ***public*** for read-only.
   - If Community values were previously defined, enter them under Community in the Read-Only or Read-Write boxes.
   - If you are a user with read-only permission, click the Read Only Mode check box.

Note

Airmux-400 is protected with Community passwords. A user may be defined with read-only permission or with read-write permission (see Chapter 4 for more details).

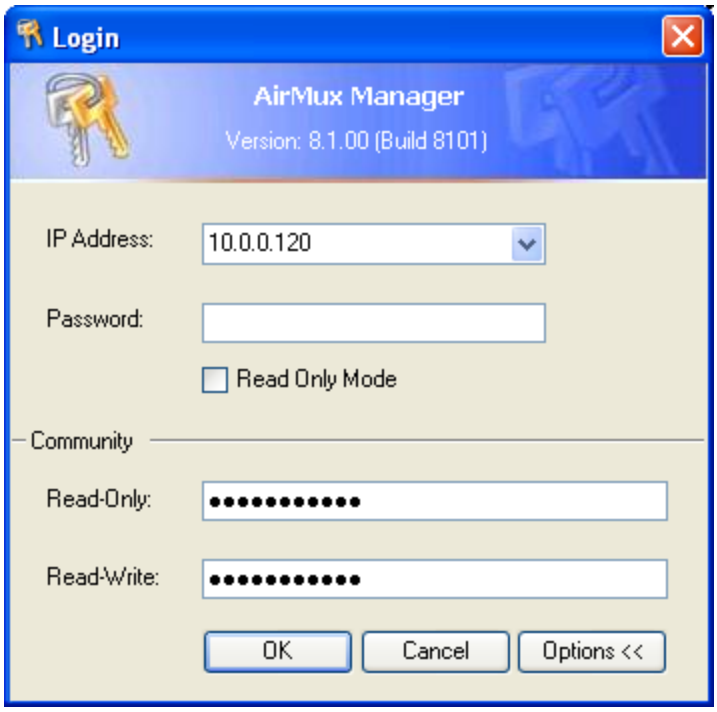


Figure 2-10. Login Screen with Community Options Visible

Login Errors

This section describes problems that may occur during login.

Unsupported Device

Attempting to connect to an unsupported device results in the following error message:

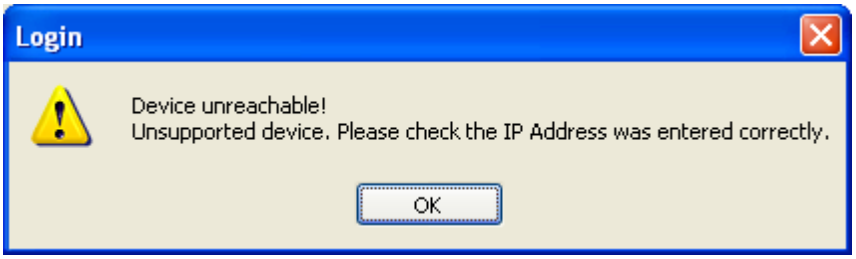


Figure 2-11. Unsupported Device Message

Incorrect IP Address

If the IP address chosen is invalid or the link is unreachable, the following error message will be displayed:

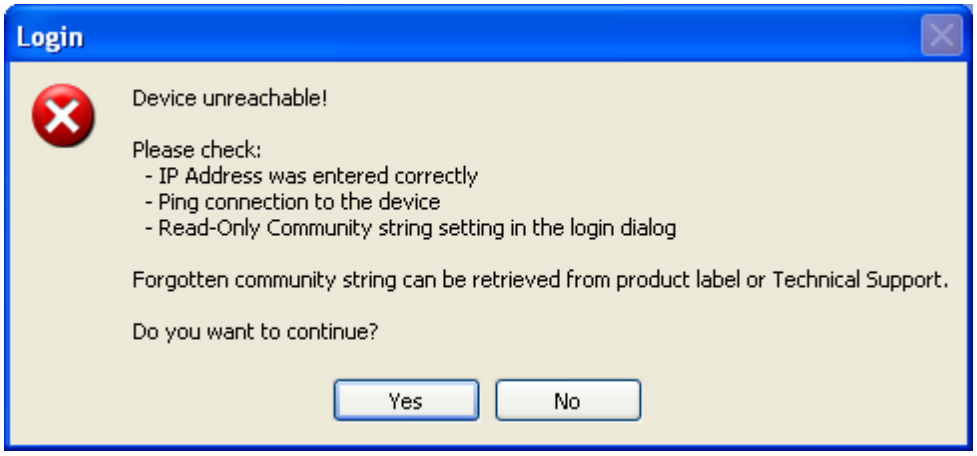

Login
Device unreachable!
Please check:
- IP Address was entered correctly
- Ping connection to the device
- Read-Only Community string setting in the login dialog
Forgotten community string can be retrieved from product label or Technical Support.
Do you want to continue?
Yes
No

Figure 2-12. Unreachable Device Message

In both of the above situations, you will see a warning graphic alongside the IP Address field.

Incorrect Password

If you type an incorrect password in the Login screen, a warning graphic is displayed alongside the password field.

Continuing without an IP Address

The Airmux Manager provides limited "offline" functionality when there is no accessible IDU/ODU. It is primarily for setting managing computer related parameters and running the Link Budget Calculator.

Changing the Login Password

➤ **To change the login password:**

1. From the Tools menu, select **Change Password**.

   The Change Password dialog box appears.

2. Enter the current password, and the new password.
3. Click OK to confirm.

Installing the Link

After the login the main Airmux Manager window is displayed.

If the login is successful, Airmux-400 displays the opening window.

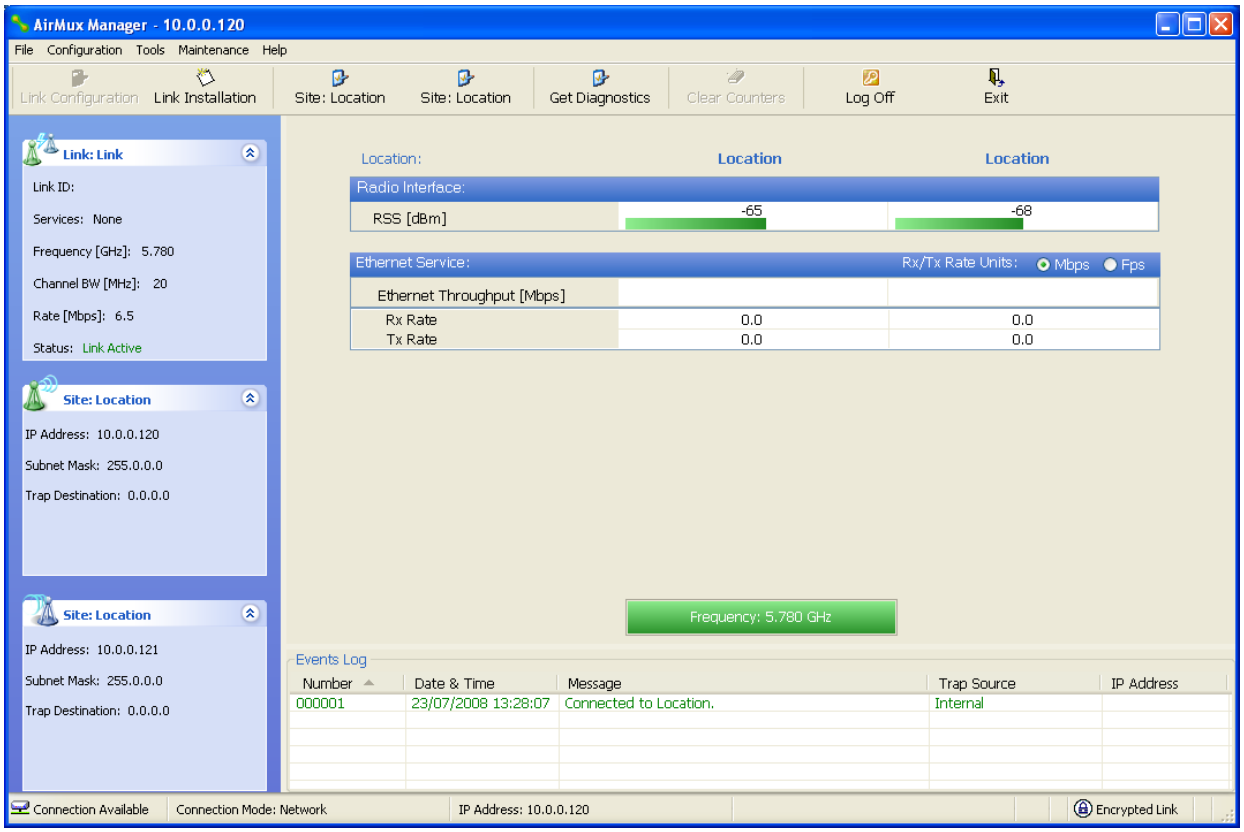


Figure 2-13. Airmux Manager Main Window

The procedure required to make the link functional has three phases:

1. Link Installation – detailed below.

   Installation actually gets the link operational by setting the link parameters. It uses a fixed channel at the lowest possible modulation, BPSK at 6.5Mbps and works under the harsh interference condition.

Note *During the installation procedure, the definition of all parameters is automatically applied to both sides of the link.*

2. Link Configuration (see *Chapter 4*)

   Configuration provides much the same functionality as Installation, but for a running link. A fallback to Installation mode is provided for situations which cannot be handled without resetting the link, such as antenna realignment and IDU or ODU replacement.

   The Link Installation and Configuration phases are both carried out with Wizards, which "walk you through" the processes. The Wizards are visually quite similar and will be described in detail below.

3. Site Configuration (see *Chapter 4*)

   Site specific configuration for each side of the link is available at any time - under a running link or under the restricted Installation mode.

   Site Configuration consists of a set of panels, which may be invoked individually in any order, as needed.

Note *An installed and configured link can be returned to installation mode for re-installation and configuration from last settings or from factory settings.*

- *Reversion to installation mode requires a complete break in the link service*
- *Configuration mode may vary the service throughput and quality, but without a service break.*

Link Installation Overview

Link installation procedure includes the following steps:

1. Initiating the link installation wizard
2. Defining system parameters
3. Selecting a channel
4. Defining transmit power and system settings
5. Viewing configuration summary and completing the wizard.

Initiating the Link Installation Wizard

➤ **To initiate the link installation wizard:**

1. In the tool bar of the Airmux Manager main window, click the **Link Installation** button.

   The Installation Wizard opens.

Note *The Link Installation button is only accessible if antennas are properly aligned. If this box is "grayed out", you should align the antennas as described in the Connecting and Aligning ODUs / Antennas section above.*

2. Click **Next** to proceed with the installation procedure.

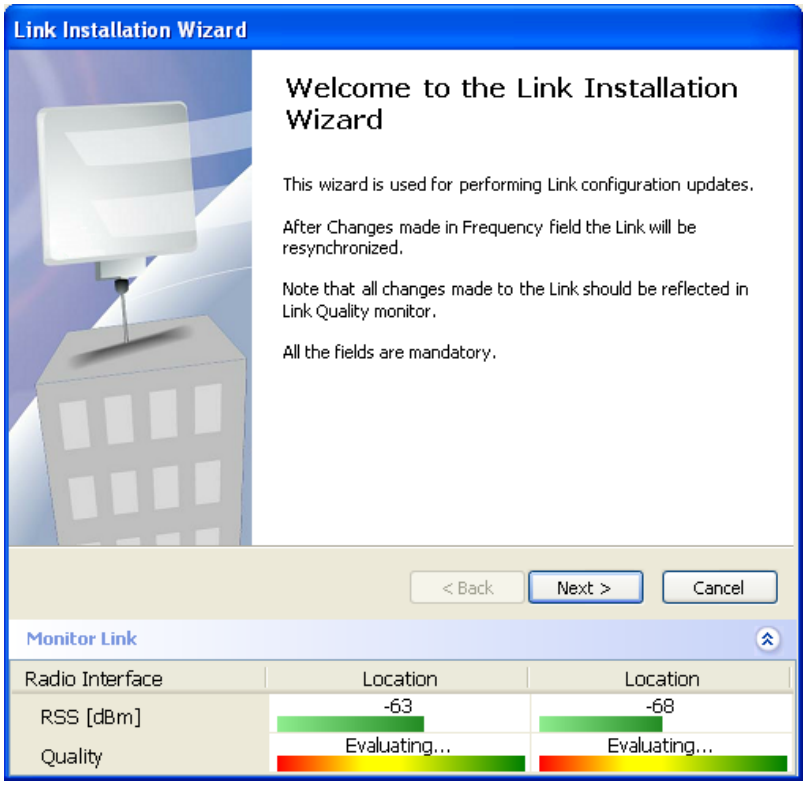


Figure 2-14. Link Installation Wizard, Opening Screen

Note *The bottom data area reproduces the corresponding data from the main window, which is obscured by the above panel.*

Defining System Parameters

The System dialog box allows configuration of the general link and site parameters.

➤ **To define the system parameters:**

1. From the System dialog box, configure the following parameters:
   - Link ID, which must be unique for each link in the area. The Link ID must include at least eight alphanumeric characters. Up to 24 characters are allowed. For maximum security, use a Link ID composed of both alphabetic and numeric characters.

Note *Both sides of a link must have the same Link ID.*

   - Link Name for the link identification. The default name is "Link". It is recommended to change the default name.
   - Site 1 and Site 2 names. The default names are both "Location". It is recommended to change the default names. Throughout this manual, A for Site 1 and B for Site 2 are used.
   - Link password (optional). Default password is ***wireless-bridge***.

Note *The link password is associated with the link, it does not have anything to do with the Airmux Manager login password.*

If an incorrect password is entered, a link is established but configuration cannot be performed and no services are available. A new link password may be obtained from RAD. You can also acquire an alternative password as explained below.

2. Click **Next** to continue.

   Airmux-400 starts evaluating the link at a default rate of 6.5 Mbps.

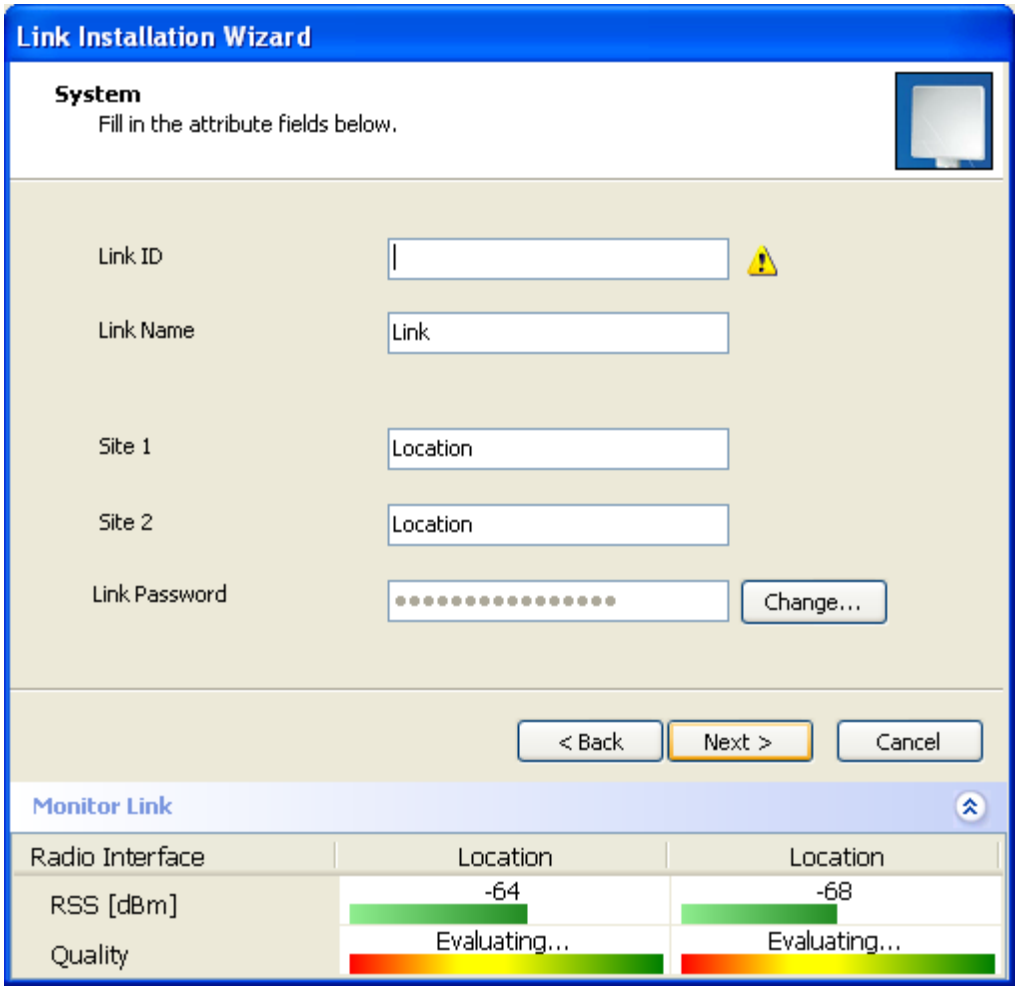


Figure 2-15. Link Installation Wizard, System Dialog Box

➤ **To change the link password:**

1. Click the Change button in the System dialog box.

   The Change Link Password dialog box opens.

2. Enter the current link password. (The default link password for a new ODU is ***wireless-bridge***). Select the Hide characters check box for maximum security.
3. Enter a new password.
4. Confirm the new password.

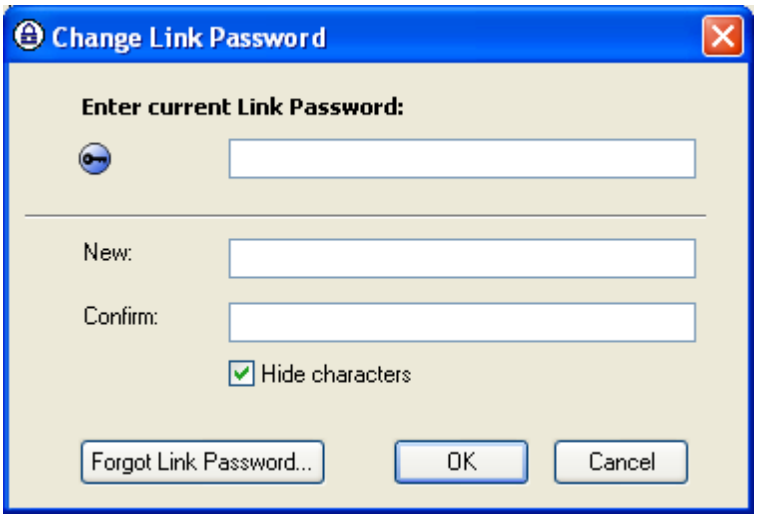


Figure 2-16. Change Link Password Dialog Box

➤ **To acquire a new password:**

1. Click the Forgotten Link Password button.

   Link Password Recovery dialog box is displayed.

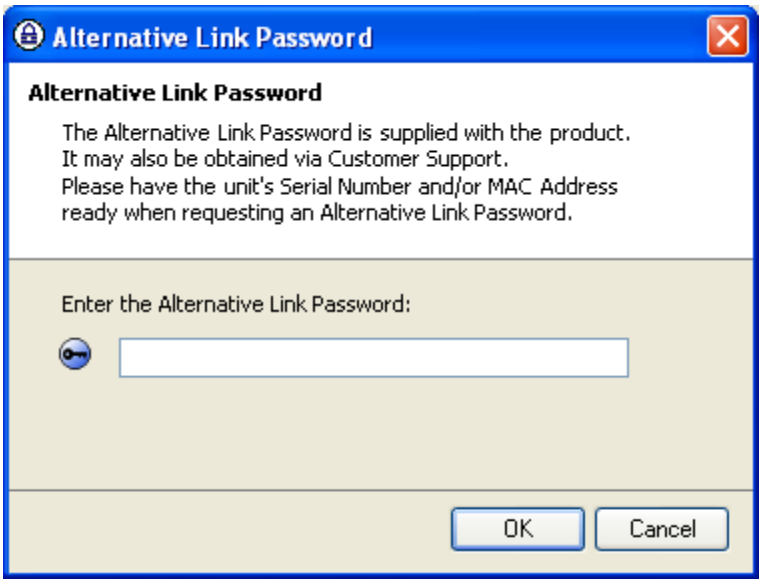

Alternative Link Password
Alternative Link Password
The Alternative Link Password is supplied with the product.
It may also be obtained via Customer Support.
Please have the unit's Serial Number and/or MAC Address
ready when requesting an Alternative Link Password.
Enter the Alternative Link Password:
OK
Cancel

Figure 2-17. Link Password Recovery dialog box

2. Follow the instructions to use the Alternative Link Password, and click **OK** to finish.

   The Change Link Password dialog box is displayed.

3. Enter a new password.
4. Retype the new password in the Confirm field.
5. Confirm the link password change.
6. Click OK to complete the procedure.

Note

- *Restoring Factory Defaults returns the Link Password to **wireless-bridge**.*
- *If the link is inactive, then the link password may also be changed from the Site Configuration dialogs.*

Selecting a Channel

Airmux-400 features an Automatic Channel Selection (ACS). In the event of sync loss, ACS chooses the first available channel in a list of monitored channels. A channel switch takes place sufficiently fast as to ensure no loss of service. Default frequency is 5.780 GHz.

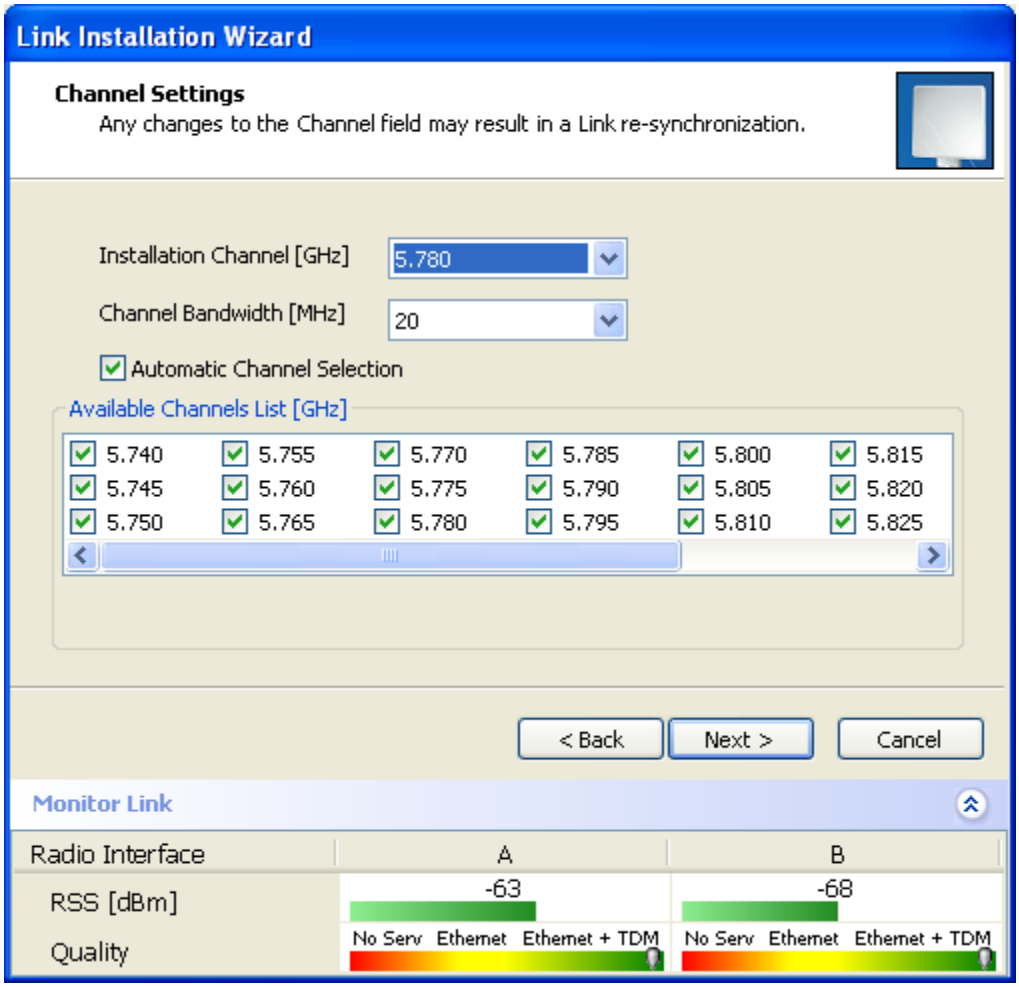


Figure 2-18. Link Installation Wizard, Channel Settings Dialog Box

➤ **To select channels to be used by the link:**

1. Select the main frequency from the Installation Channel box.

Note

Currently the channel bandwidth is permanently set to 20 MHz

2. Click the check box if Automatic Channel Selection is required.

3. The Available Channels List contains all of the allowable channels for the link. Check the channels that can be automatically selected.

   Selecting a new channel causes the system quality to change. The Quality bar provides an indication of the link quality from poor (red) to good (green).

4. Click **Next**.

Configuring Transmit Power and Antenna Settings

The choice of Tx power, antenna gain and cable loss determines the EIRP and is affected by such considerations as radio limitations and regulatory restrictions.

Before proceeding to antenna installation details, the following background information should be considered:

Each Airmux-400 ODU is made of two radio transceivers (radios). The radios make use of algorithms that utilize both polarization and space diversity resulting in enhanced capacity, range and link availability. The number of antennas (i.e. radios) used is determined by user configuration and by automatic system decisions, explained below.

Dual Antennas at Both Sites

Using dual antennas at both sites (single bipolar antenna or two monopolar antennas) enables the use of MIMO technology. With MIMO the system doubles the link capacity. At the same time, it keeps the same rate and modulation per radio as was used with single antenna, thus increasing capacity, range and availability.

For example, with a dual antenna Airmux-400 transmits at modulation of 64 QAM and FEC of 0.83 and get an air rate of 130 Mbps, compared to 65 Mbps with single antenna.

To work in this mode, each antenna port must be connected to an antenna, the RSS level in both receivers should be balanced and a minimal separation between the antennas must be maintained. (For example, by using dual polarization antennas a cross polarization separation is attained).

Upon selecting Antenna Type as Dual, Airmux-400 automatically doubles the air rates.

Airmux Manager indicates a case of unbalanced RSS between the two antennas.

Single Antennas at Both Sites

By selecting a single antenna at both sites the ODUs operate with a single radio that is connected to the ANT 1 connector. The second radio is automatically shut down.

Single and Dual Antennas

In this mode one of the sites uses the ODU with a single antenna while the other site uses the ODU with a dual antenna.

The advantages in this mode in comparison to using a single antenna in both sites are doubled total Tx power and additional polarization and/or space diversity.

Airmux-400 automatically switches to this mode if one of the ODUs is connected to a dual antenna or if the RSS at one of the ODU receivers is below minimal level.

The air rates used in this mode are same as when using single antennas in both sites.

The rates used by Airmux-400 are shown below:

Table 2-2. Transmission Rates

Radio	Modulation	FEC	Air-Rate [Mbps]
Single	BPSK	1/2	6.5
Single	QPSK	1/2	13
Single	QPSK	3/4	19.5
Single	16QAM	1/2	26
Single	16QAM	3/4	39
Single	64QAM	2/3	52
Single	64QAM	3/4	58.5
Single	64QAM	5/6	65
Dual	BPSK	1/2	13
Dual	QPSK	1/2	26
Dual	QPSK	3/4	39
Dual	16QAM	1/2	52
Dual	16QAM	3/4	78
Dual	64QAM	2/3	104
Dual	64QAM	3/4	117
Dual	64QAM	5/6	130

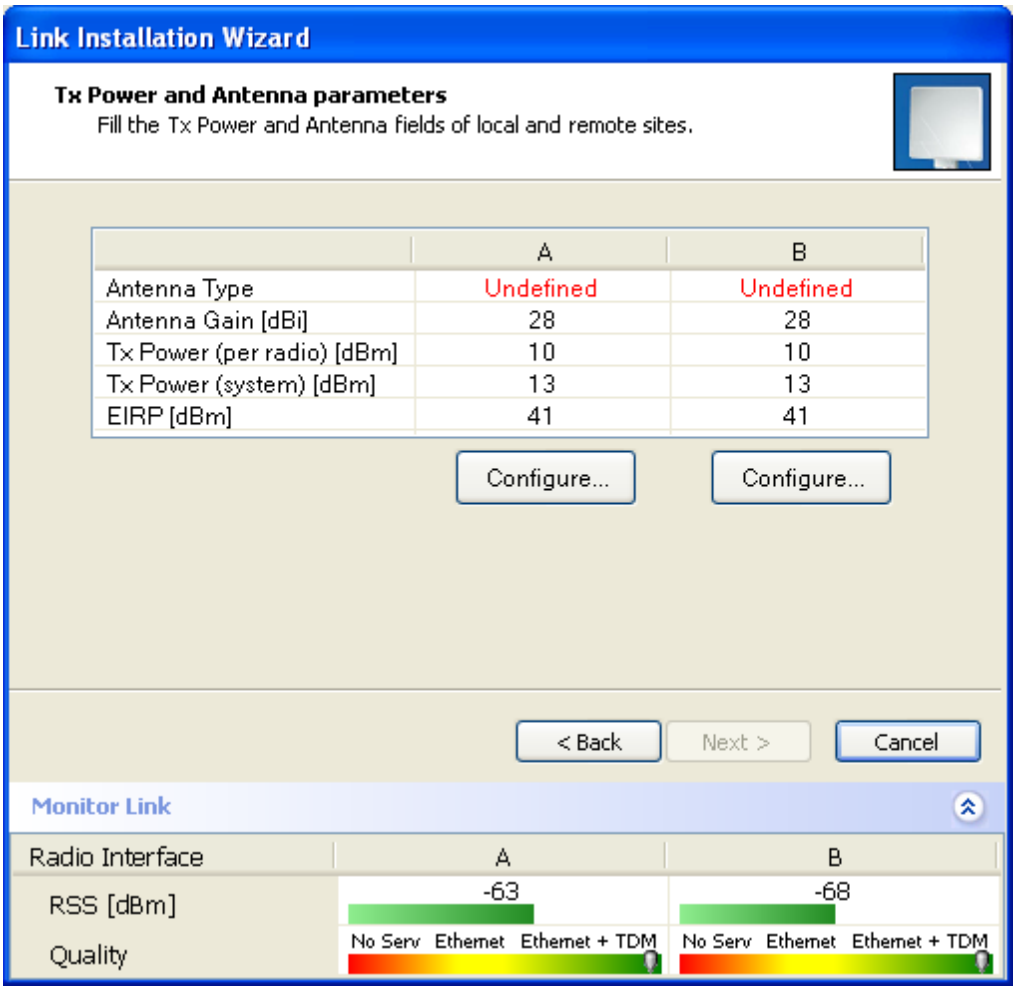


Figure 2-19. Link Installation Wizard, Tx Power and Antenna Parameters Dialog Box

Considerations for Changing Antenna Parameters

Let:

- maxAllowedTx Power (Required Tx Power per Radio in *Figure 2-20*) denote the maximum Tx Power practically available from an ODU.
- maxRegEIRP (Max EIRP in *Figure 2-20*) denote the maximum EIRP available by regulation. It is determined by three factors:
  - per band/regulation
  - per channel bandwidth
  - antenna gain
- maxRegTxPower denote the maximum regulatory Tx Power for the equipment, also having regard the above three points.
- maxODUTxPower denote the maximum Tx Power of the ODU, itself depending on the air rate used.

Then, the following relationship must be satisfied:

$$maxAllowedTxPower \leq min(maxRegEIRP - AntennaGain + CableLoss, maxRegTxPower) \quad (*)$$

➤ **To set Tx power and configure antennas:**

1. Click the Configure buttons in turn to configure the antennas on both sides of the link. Each one offers a dialog like this:

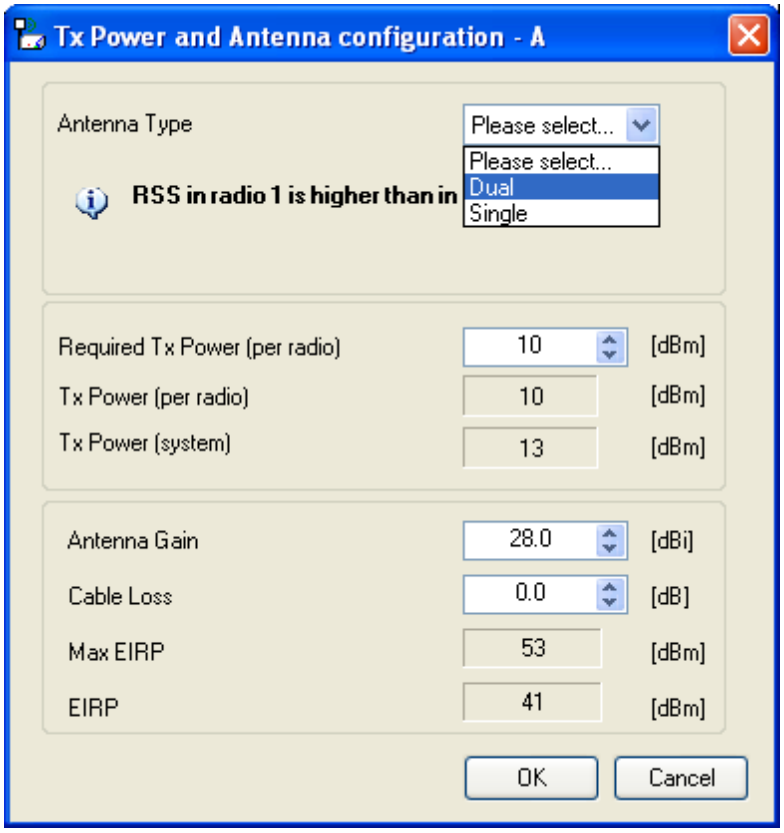


Figure 2-20. Antenna Configuration Dialog with Opened Type Selection

2. Choose the antenna type and required transmission (Tx) power for the first site and click **OK**. Repeat the process for the second site.

   The Tx power (per radio) indicates the power of each radio inside the ODU and is used for Link Budget Calculations. The Tx power (System) shows the total transmission power of the ODU and is used to calculate the EIRP according to regulations.

Note *To see the relationship between Tx Power (radio) and TX Power (system), note that* $dBm = 10 \times \log_{10} milliWatt$ *so that if you double the power in milliWatts (for two radios) then dBm will increase by* $10 \times \log_{10} 2 \approx 3$.

3. Set the Antenna Gain and Cable Loss. If do this you will receive a warning message:

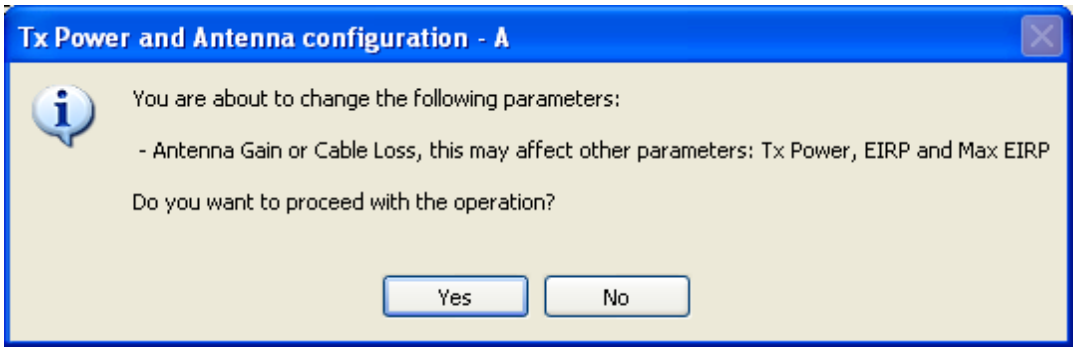

Tx Power and Antenna configuration - A
You are about to change the following parameters:
- Antenna Gain or Cable Loss, this may affect other parameters: Tx Power, EIRP and Max EIRP
Do you want to proceed with the operation?
Yes
No

Figure 2-21. Antenna Parameters Change Warning

Note

- *The Max EIRP level will be automatically set according to the selected band and regulation.*
- *The EIRP level is the sum of the System Tx power and the Antenna Gain minus the Cable Loss.*

If inequality **(*)** above is violated, then the following warning window is displayed:

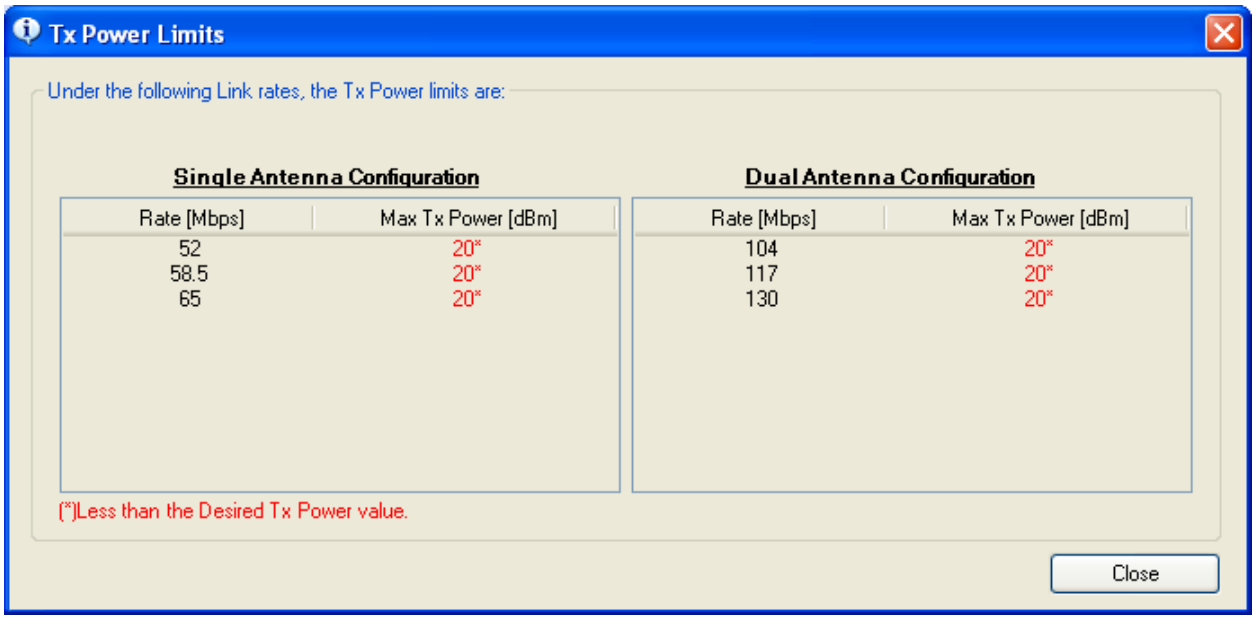


Figure 2-22. Tx Power Limits

The precise relationship between the items in inequality **(*)** and the window of *Figure 2-20* is follows:

- Required Tx Power (per radio) will be adjusted down to the lesser of the value entered and **maxAllowedTxPower**
- TxPower (system)is **maxAllowedTxPower + 3** (for 2 radios)
- Max EIRP is **maxRegEIRP**.
- EIRP is **maxAllowedTx Power + Antenna Gain - Cable Loss**

The table in *Figure 2-22* only shows rates where the maximum Tx Power is the limitation, rather than regulations.

Note *The **maxAllowedPower** and **maxEIRP** are regulatory. In an unregulated environment, the only limit is **maxODUTxPower.***

When you close the window of Figure 2-22, the change you requested will **not** be honored, and you will need to try again.

4. When you are finished with Tx Power configuration, click **Next.**

Configuring the Services

Currently Ethernet Only is the only available service. You may choose a specific modulation rate or use Adaptive.

➤ **To configure the services:**

1. In the Services dialog box, choose Adaptive or one of the available rates
2. Click **Next** to continue.

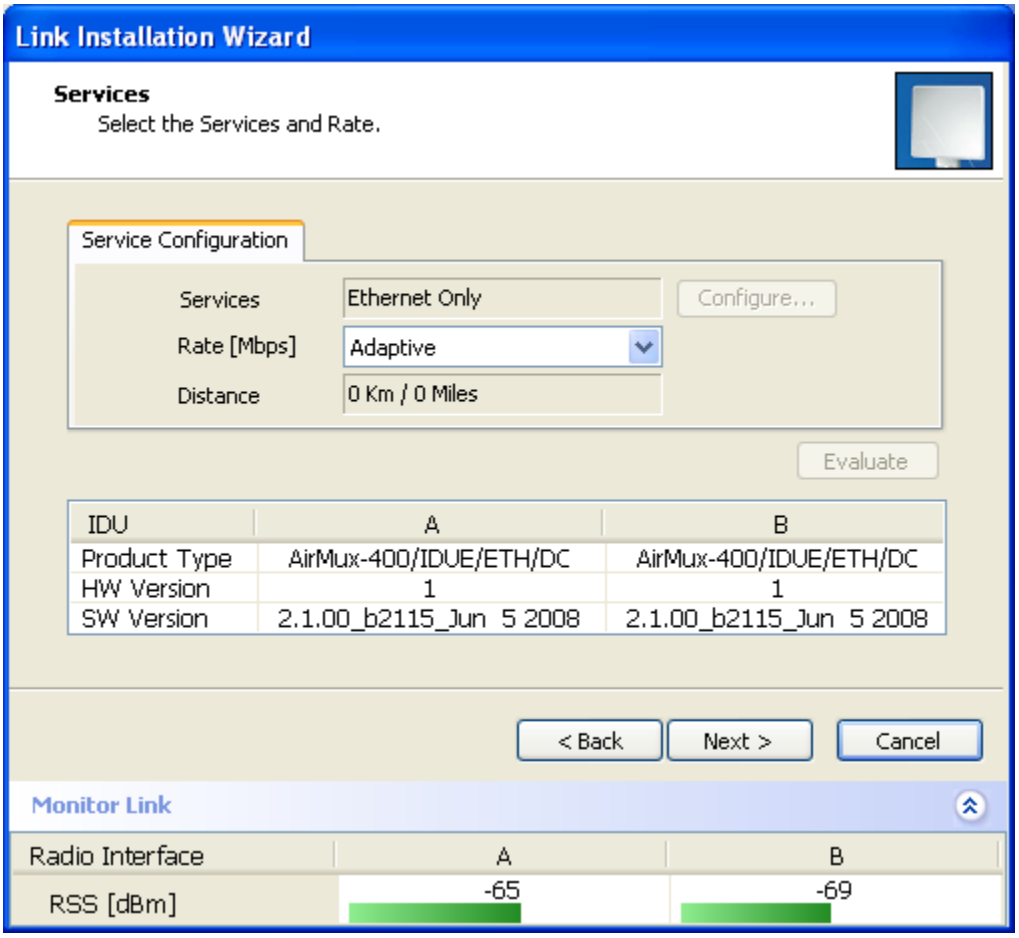


Figure 2-23. Link Installation Wizard, Services Dialog Box

Completing the Link Installation

The last screen of the link installation wizards allows you to view the configuration summary.

➤ **To complete the link installation:**

- In the Installation Summary dialog box, click **Done**.

  The main Airmux Manager window is displayed (*Figure 2-25*).

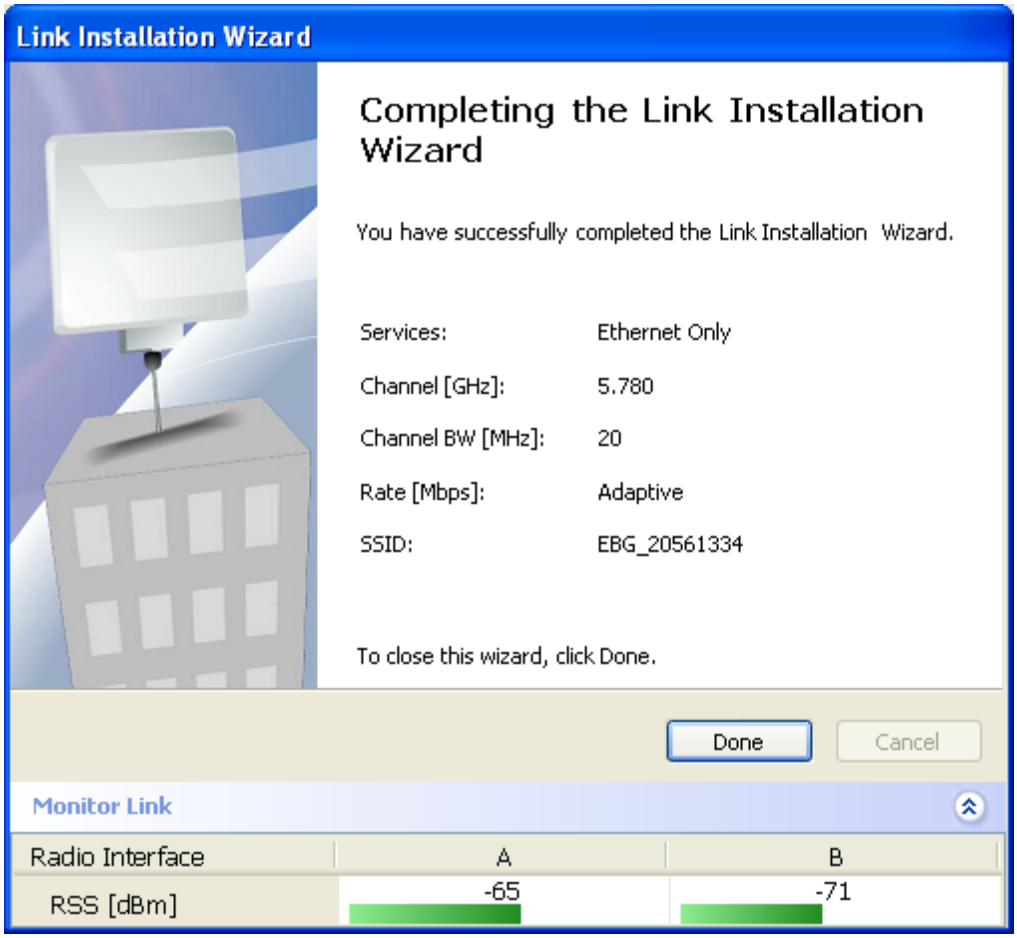


Figure 2-24. Link Installation Summary

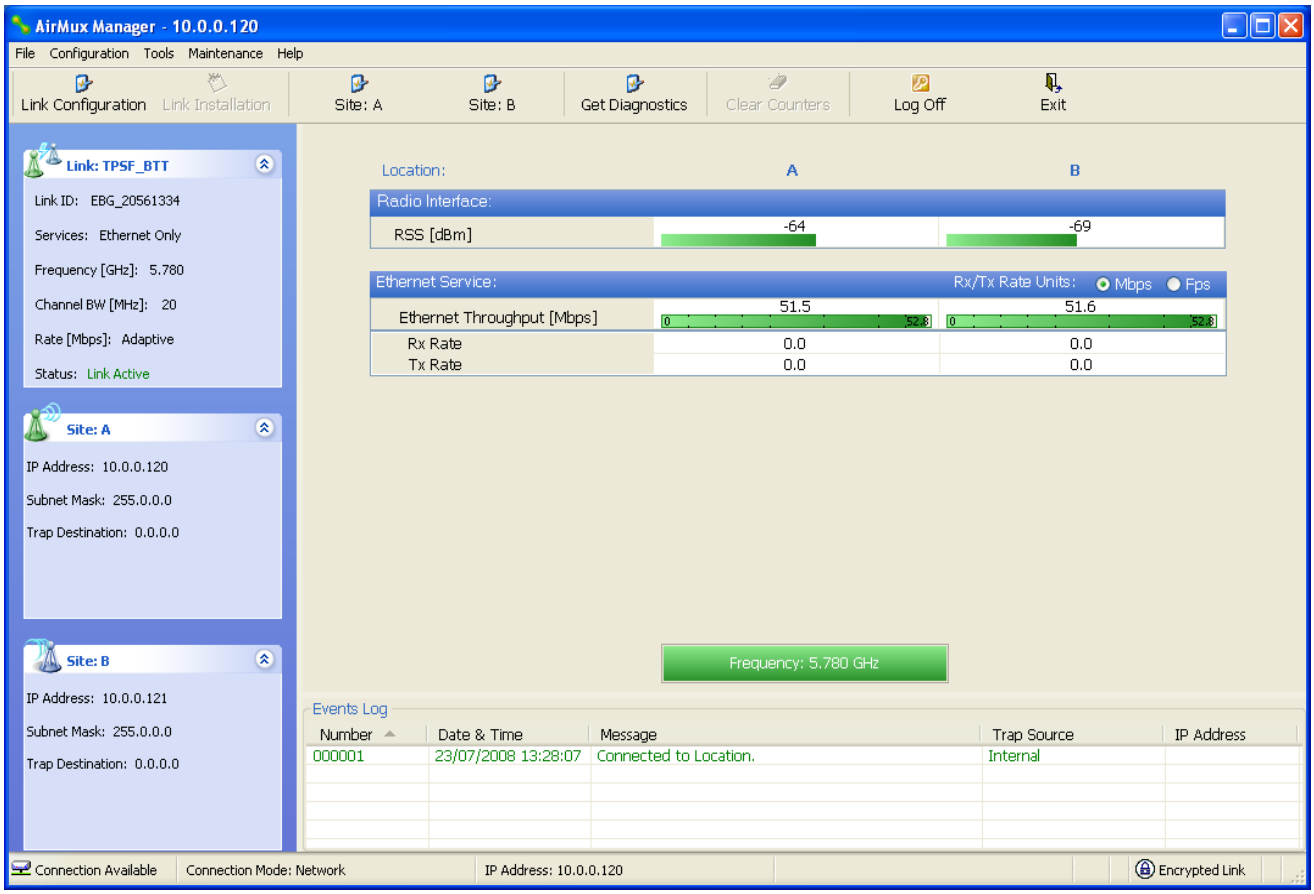


Figure 2-25. Main Window after Link Installation

➤ **To verify the installation:**

- Verify that the Radio Signal Strength (RSS) is according to expected results as determined by the Link Budget Calculator.

Caution Installation mode, as described above, may be re-entered using **Configuration | 1 Configure Site A** and **Installation Mode** the Site Configuration dialog. Some Installation mode functionality may cause a break in link service.

If you can accomplish link changes without breaking the service, always prefer to use Link Configuration mode, described in *Chapter 4*.

Chapter 3

Operation

This section provides the following information for Airmux-400:

- Operating procedures (turning-on and turning-off)
- IDU indicators
- Normal indications
- Default settings
- Managing the Airmux-400.

3.1 Turning On the Unit

➤ To turn on Airmux-400:

- Connect the AC/DC converter to the IDU power connector and to the mains. See *Chapter 2* for full instructions on connecting the power.

  The PWR indicator lights up (IDU only) and remains lit as long as the IDU is receiving power.

Airmux-400 requires no operator attention once installed, with the exception of occasional monitoring of front panel indicators and statistics data. Intervention is only required when Airmux-400 must be configured to its operational requirements, or diagnostic tests are performed.

3.2 Indicators

The front panel of the IDU and IDU-E includes a series of LED indicators that show the operating status of the unit. *Figure 3-1* shows the IDU front panel. *Table 3-1* describes the front panel indicators.

Figure 3-1. IDU Front Panel

Table 3-1. Front Panel LEDs

Name	Color	Description	Location
IDU	Green	ON – IDU operational	Front panel
	Orange	ON – During power-up only	
	Red	ON – Failure	
ODU	Green	ON – ODU-to-IDU communication link is operating	Front panel
	Red	ON – ODU-to-IDU communication link is disrupted	
AIR I/F	Green	ON – Wireless link is synchronized	Front panel
	Orange	ON – During installation only	
	Red	ON – Wireless link lost synchronization	
SVC		Reserved for future use	Front panel
HSS		Reserved for future use	Front panel
LINK	Green	On – Good Ethernet link integrity	LAN connector
ACT	Yellow	Blinks according to the Ethernet traffic	LAN connector

3.3 Default Settings

Table 3-2 lists the default settings of the Airmux-400 configuration parameters.

Table 3-2. Default Settings

Parameter	Description	Default Value	Menu Path	Setting Instructions
Aging Time	MAC address aging period	300 sec	–	IDU Aging Time
Ethernet Mode	Line speed and duplex mode negotiation	Auto Detect	Advanced	Configuring Ethernet Mode
Frequency	Operation channel frequency	First frequency in the range	–	Selecting Channels
Link ID	Wireless link identification	Link	–	Defining System Parameters (Chapter 2)
Link Password	Wireless link password	wireless-bridge	–	Defining System Parameters (Chapter 2)
Local-public	Local-public community name	bru1	–	Configuring SNMP Communities
Manager Logon Password	Login password of the Airmux Manager	admin	–	Changing the Login Password (Chapter 2)

Parameter	Description	Default Value	Menu Path	Setting Instructions
ODU IP Address	IP address of the ODU	10.0.0.120	Management	Defining the Management Addresses
ODU Mode	Ethernet mode of the ODU	Hub	Advanced	Configuring Ethernet Mode
Rate	Transmission rate	Adaptive	–	Configuring Service Parameters
Read-only	Read-only community name	public	–	Configuring SNMP Communities
Read-write	Read-write community name	netman	–	Configuring SNMP Communities
Remote-public	Remote-public community name	bru4097	–	Configuring SNMP Communities
Site 1	Site 1 name	Site	–	Defining System Parameters (Chapter 2)
Site 2	Site 2 name	Site	–	Defining System Parameters (Chapter 2)
Subnet Mask	IP address of the ODU	255.0.0.0	Management	Defining the Management Addresses
Trap destination	IP address of an NMS to be receiving traps	0.0.0.0	Management	Defining the Management Addresses

3.4 Configuration and Management Alternatives

The Airmux-400 configuration and monitoring operations are performed using one of the following tools:

- GUI-based management utility
- Telnet.

Most of the Airmux-400 management and operation parameters are set using link configuration wizard. If necessary, the local and remote unit parameters can be reconfigured via the Airmux-400 management utility.

Telnet management is performed from a Telnet host using *display* and *set* commands.

The capabilities of the two options listed above are identical.

Working with the Airmux-400 Management Utility

Before starting a management session, make sure that a communication link between local and remote units exists. The Link Status indication bar in the middle of the Main menu must be green and the *Radio Link - Sync* message must appear in the event log (see *Figure 3-2*).

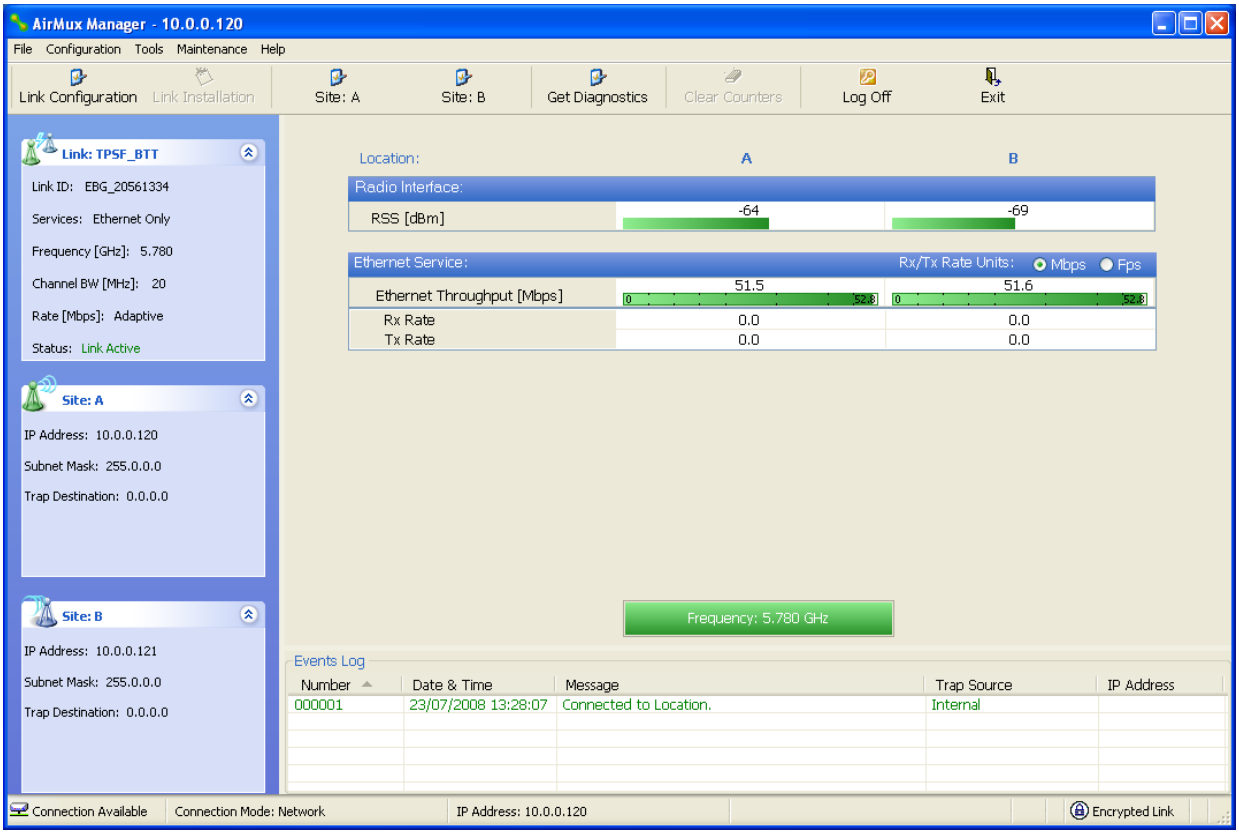


Figure 3-2. Main Screen, Wireless Link is Active

The Airmux Manager main screen consists of the following elements:

- Toolbar – includes buttons serving for:
  - Link Configuration – Changes configuration parameters of an operating wireless link; assigns text files for storing alarms, statistics and configuration data. This button is disabled until a link installation has been completed.
  - Link Installation – Performs preliminary configuration of the system. This button is disabled after the link is installed.
  - Site: ‹Site 1 name› – Opens the Site configuration dialog for Site A. Same as Configuration › 1 Configure ‹Site 1 name›
  - Site: ‹Site 2 name› – Opens the Site configuration dialog for Site B. Same as Configuration › 2 Configure ‹Site 2 name›
  - Get Diagnostics – Obtain system information
  - Clear Counters – Disabled
  - Log off – Closes the current session and logs off Airmux Manager

- Exit – Exits Airmux Manager.

- Menu Bar
  - File Menu – Log off, and exit
  - Configuration – use for link configuration, individual site configuration or link installation
  - Tools – set performance monitoring, event log handling, change password and preferences
  - Maintenance – Loopbacks, clear counters, system reset
  - Help – displays user manual, link budget calculator, system information, Airmux Manager build version.
- Link detail pane summarizes information on the radio link (link ID, configured services frequency, channel bandwidth, current rate and link status)

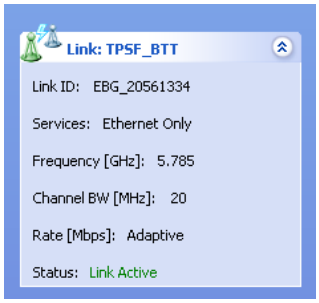


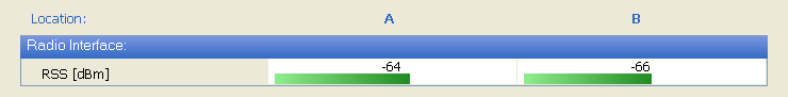
Figure 3-3. Link Detail Pane

- Site detail pane show basics link site details (IP address, subnet mask, trap destination)

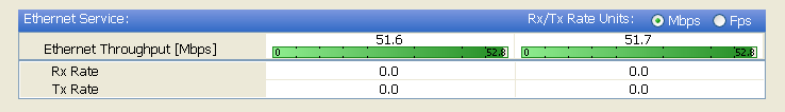
Figure 3-4. Site Detail Pane

- Monitor pane, is the main source of real time information about link performance at both link sites. It includes the following panes (top to bottom):

- Radio Interface, Received Signal Strength (RSS) in dBm



- Ethernet Service:



  - Ethernet Throughput: The numbers are the current calculated throughputs at each site. The colored bars (with numbers) indicate the maximum possible throughput having regard for air conditions.
  - Rx and Tx Rates: Actual Ethernet traffic received and transmitted rates per site, in Mbps of Fbps.

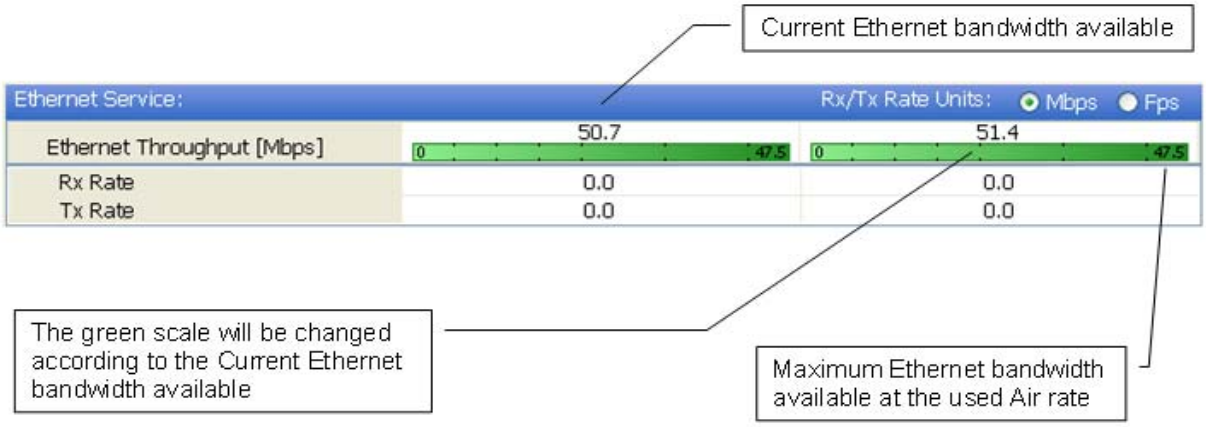
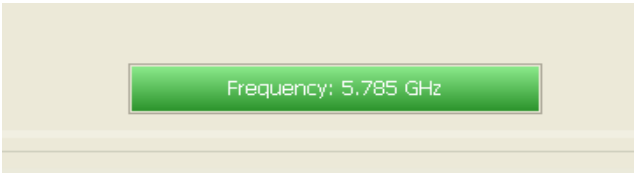


Figure 3-5. Ethernet Bandwidth Indication



  - Frequency box: It shows the link frequency. The color of the box indicates the status

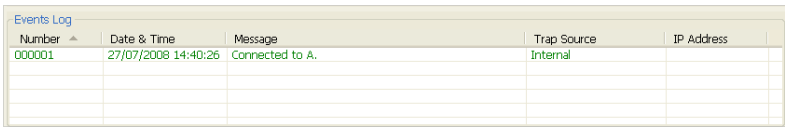
    Green – active link

    Red – inactive link

    Magenta – authentication or compatibility problem

    Brown – severe compatibility problem

- Events Log stores alarms generated from both sides of the link



- Status Bar displays the current system status:
  - Connectivity – shows if Airmux Manager is communicating with the ODU
  - Connection available – connection mode to the ODU
    - Over-the-Air connection – using the IP address of the remote unit.
    - Local connection – direct connection to the IDU without using an IP address
    - Network connection – connection via a LAN
- IP Address – login IP address
- Encryption indicator
  - – Normally encrypted link
  - – Link password validation failed. The link is encrypted with default keys. Service and configuration are unavailable. Change the link password.

Note *There are several "floating" icons, which appear under specific conditions*

Working with Telnet

Typically, the Telnet host is a PC or a Unix station with the appropriate suite of TCP/IP protocols. The login password is identical to the community strings. Read allows read-only access. Read/write allows using *display* and *set* commands.

Table 3-3 lists the Telnet commands supported by Airmux-400.

Table 3-3. Telnet Commands

Command	Description
display inventory	Displays ODU product name, name, location, hardware and software revisions, uptime, MAC address, IDU product name, IDU software and hardware revisions
display management	Displays IP, subnet, gateway, traps table
display link	Displays state, SSID, channel BW, RSS, TSL, frequency/ACS, DFS, rate/ARA, distance
display Ethernet	Displays bridge mode, aging time, port table (state, status and action)
display tdm	Displays clock mode, master clock mode, current clock, quality[1], TDM table (line status, error blocks)
display ntp	Displays time, server and offset

Command	Description
display PM <interface:AIR,LAN1,LAN2,TDM1,TDM2,TDM3,TDM4> <interval:current,day,month>	Shows the performance monitor tables for each interface according to user defined monitoring intervals
set ip <ipaddr> <subnetMask> <gateway>	Set the ODU IP address, subnet mask and gateway The user must reset the ODU after the command completion
set trap <index:1-10> <ipaddr> <port:0-65535>	Set a specific trap from the traps table (set trap 3 10.0.0.133 162)
set readpw <oldpasswd> <passwd>	Set the read access password (read community)
set writepw <oldpasswd> <passwd>	Set the read-write access password (read-write community)
set trappw <oldpasswd> <passwd>	Set the trap community string
set buzzer <mode:0=OFF,1 =ON>	Toggle the buzzer mode (0 – off, 1 – on)
set tpc<power:Value between minimal TX power, and maximal TX power>	Set the ODU transmit power. If a wrong value is entered, both min and max values shall be displayed in the error reply
set bridge <mode:0=Bridging OFF, 1= Bridging ON >	Set the ODU bridge mode (0 – off, 1 – on)
set name <new name>	Set the name of the link
set location <new location>	Set the name of the location
set contact <new contact>	Set the name of the site manager
set Ethernet <port: MNG,LAN1,LAN2> <mode: AUTO,10H,10F,100H,100F, DISABLE>	Set the mode and speed of each ethernet port
reboot	Reset both the IDU and the ODU. The user shall be prompt that the command will reset the device and that he/she has to restart the Telnet session.
help	Displays the available commands

Figure 3-6 shows the available Telnet commands via the Help command.

```
Hello admin, welcome to ODU Management CLI!
+-----------------------------------------------------------+
     Software Revision          1.770_b1115_Aug 13 2007
+-----------------------------------------------------------+


admin@10.103.6.1-> help
    display inventory
    display management
    display link
    display ethernet
    display tdm
    display ntp
    display PM <interface:AIR,LAN1,LAN2,TDM1,TDM2,TDM3,TDM4>
               <interval:current,day,month>
    set ip <ipaddr> <subnetMask> <gateway>
    set trap <index:1-10> <ipaddr> <port:0-65535>
    set readpw <oldpasswd> <passwd>
    set writepw <oldpasswd> <passwd>
    set trappw <oldpasswd> <passwd>
    set buzzer <mode:0=OFF,1 =ON>
    set tpc <power:Value between minimal TX power, and maximal TX power>
    set bridge <mode:0=Bridging OFF,1= Bridging ON >
    set name <new name>
    set location <new location>
    set contact <new contact>
    set Ethernet <port:MNG,LAN1,LAN2>
                 <mode:AUTO,10H,10F,100H,100F,DISABLE>
    reboot
    help
Command "help" finished OK.
```

Figure 3-6. Telnet Management Screen

3.5 Turning Off the Unit

➤ To turn off Airmux-400:

1. Exit the management application.
2. Remove the AC/DC converter power cord from the mains.

Chapter 4

Configuration

This chapter describes configuration procedures, which are performed after the physical installation of the local and remote Airmux-400 units and the Installation Link wizard has been performed. The following parameters are configured via the Configuration Wizard:

- System parameters
- Frequency channel
- Transmit power and antenna
- Service parameters.

The following parameters are defined via the Site Configuration dialog.

- System parameters
- Air interface (Transmit (Tx) power and antenna)
- Network management including VLAN
- Security settings
- Date and time
- Ethernet mode (hub or bridge).

4.1 Configuring via Configuration Wizard

The configuration wizard is used to redefine the configuration parameters if necessary. Both sites in the link are defined simultaneously.

Configuring the System Parameters

After installing the link, the system configuration can be modified.

Note

All parameter changes are automatically applied to both sides of the link.

➤ To change general parameters:

1. In the Main menu, click the **Link Configuration** button.
2. The Configuration wizard opens (*Figure 4-1*).

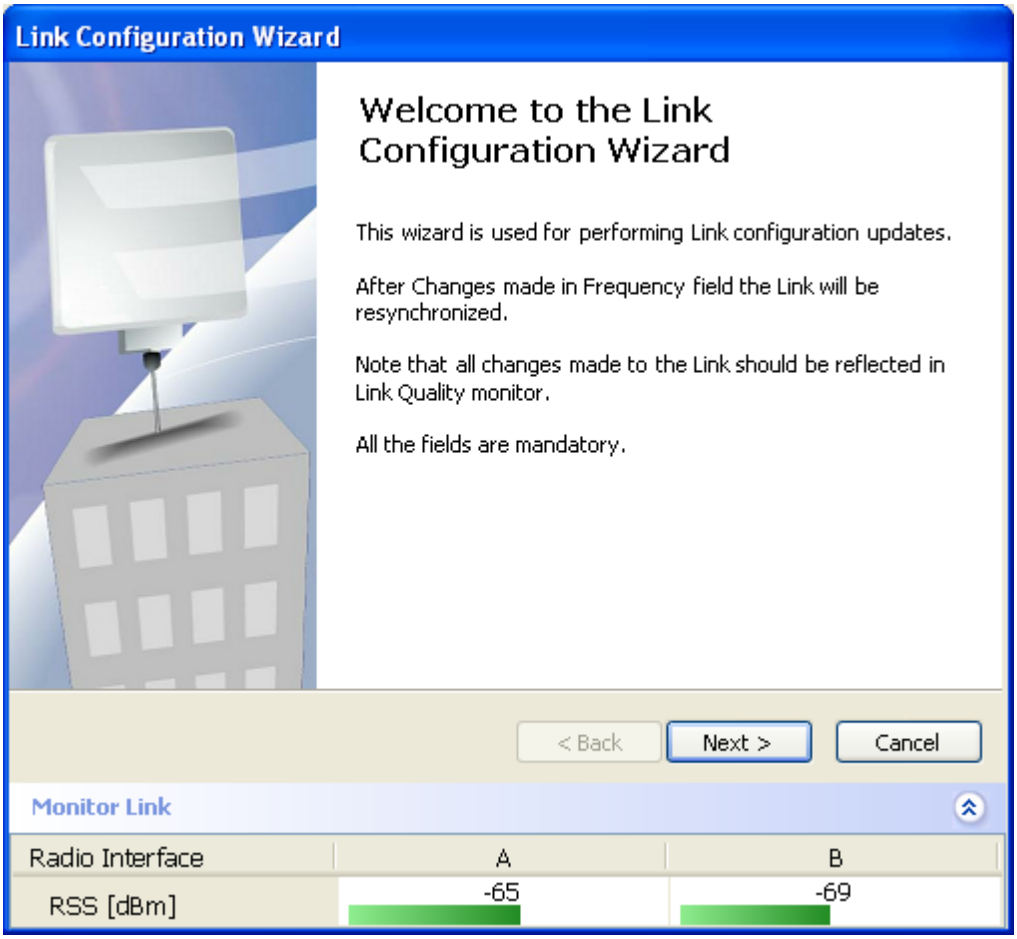

Link Configuration Wizard
Welcome to the Link Configuration Wizard
This wizard is used for performing Link configuration updates.
After Changes made in Frequency field the Link will be resynchronized.
Note that all changes made to the Link should be reflected in Link Quality monitor.
All the fields are mandatory.
< Back
Next >
Cancel
Monitor Link
Radio Interface
A
B
RSS [dBm]
-65
-69

Figure 4-1. Configuration Link Wizard

3. Click **Next**.

   The Link Configuration dialog box appears (see *Figure 4-2*).

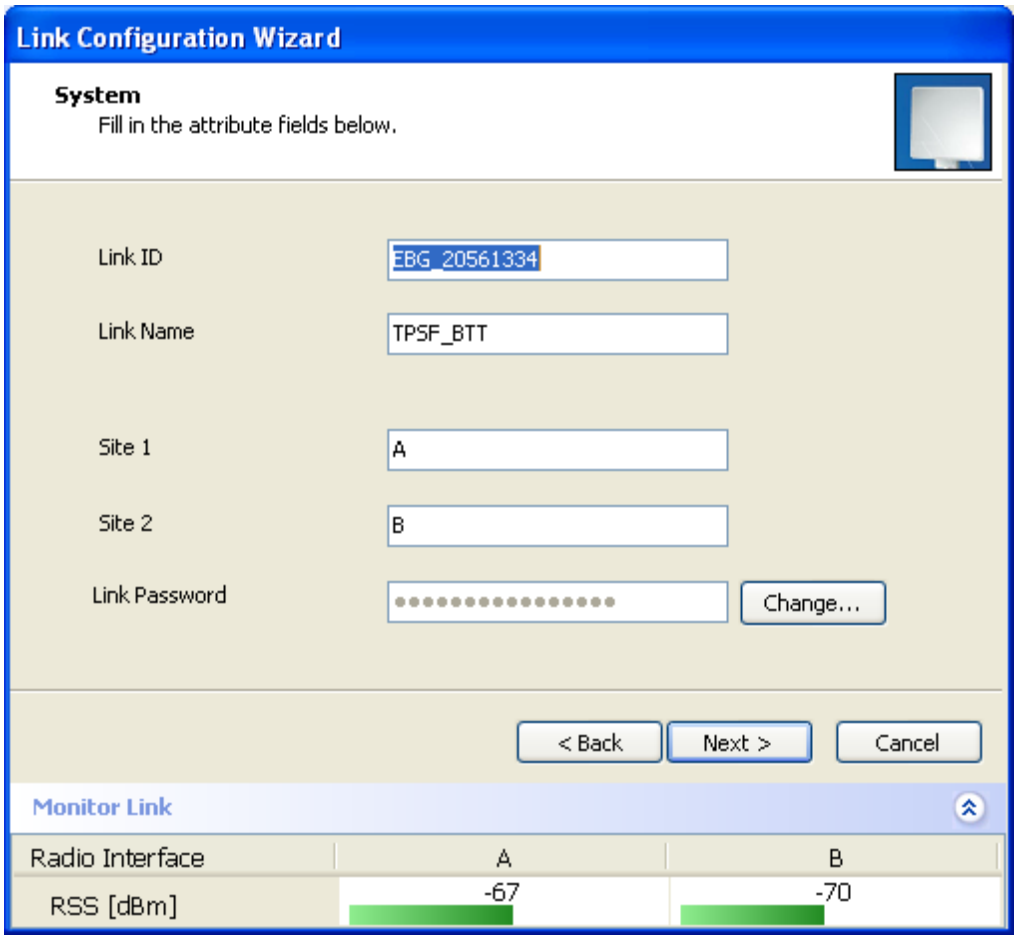


Figure 4-2. Link Configuration, System Dialog Box

4. In the System dialog box, enter the new data for the link. All fields with a white background can be edited.

Procedure for changing a link password is the same as during the link installation process, see *Defining System Parameters* in Chapter 2.

5. Click **Next**.

   The Frequency dialog box appears.

Selecting Channels

The user is required to define the operating frequency channel. Procedure for selecting channels is the same as during the link installation process, see *Selecting a Channel* in Chapter 2.

Automatic Channel Select enables Airmux-400 to change frequency channels automatically if the quality of the current operating channel deteriorates.

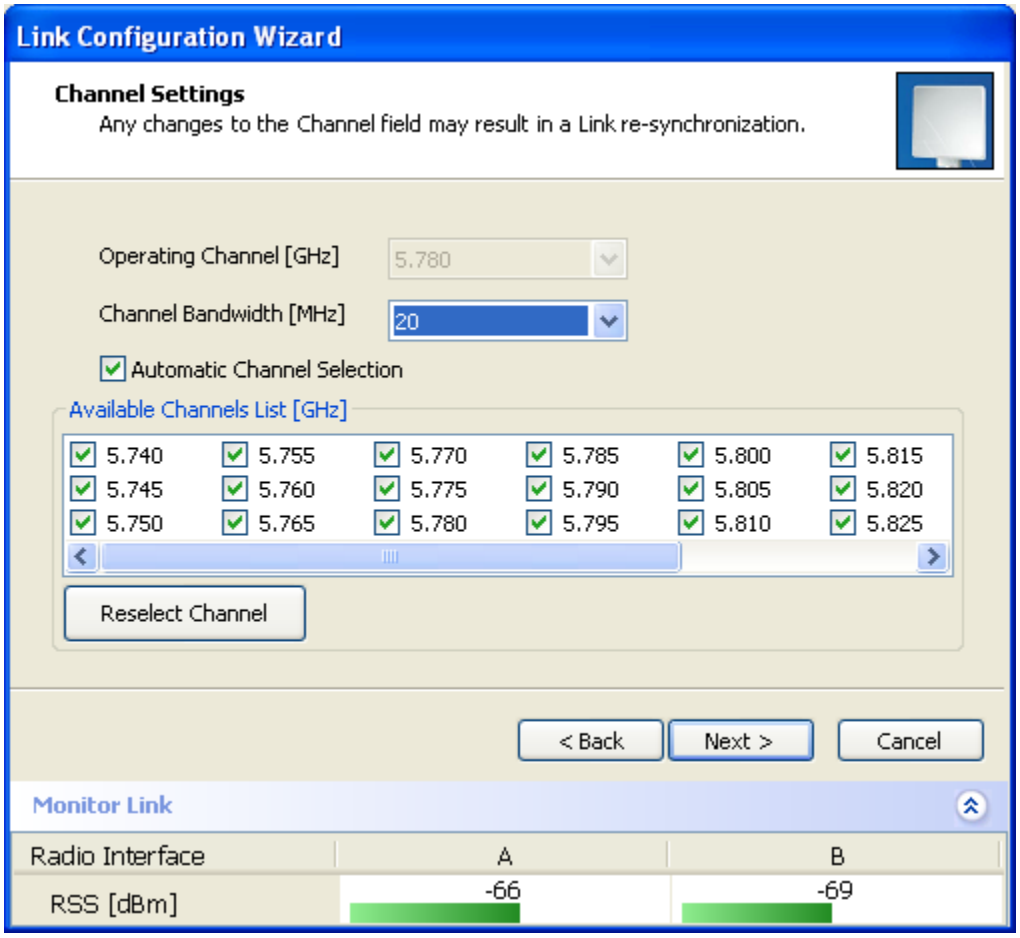


Figure 4-3. Channel Select Dialog Box – Automatic Channel Selection

➤ **To choose a channel automatically:**

1. Select the main frequency from the Operating Channel menu.
2. Select the required Bandwidth.
3. Click the check box if Automatic Channel Selection is required.
4. Click the check boxes in the Available Channels List of all the allowable channels that can be automatically selected.
5. If you are not satisfied with the channel that is selected automatically, click **Reselect Channel**.

   A new channel will be selected from one of the Available Channels that have been defined.

Note *By clicking Reselect Channel, the ODU starts scanning all the channels from the available channels list and looks for radio frequency activity in each of the channels. It tries to select the optimal pure channel. If another channel is required, the operating channel that the ODU finds most pure must be removed from the available channel list.*

6. Click **Next**.

➤ **To choose a channel manually:**

1. Leave the Automatic Channel Selection box unchecked.
2. Select the main frequency from the Operating Channel menu.

   If you select Other operating channel, an additional spin box is displayed. It allows you to fine-tune the frequency in increments of ±5 MHz within a range of 5.740–5.835 GHz.
3. Select the required Channel Bandwidth.
4. Click **Next**.

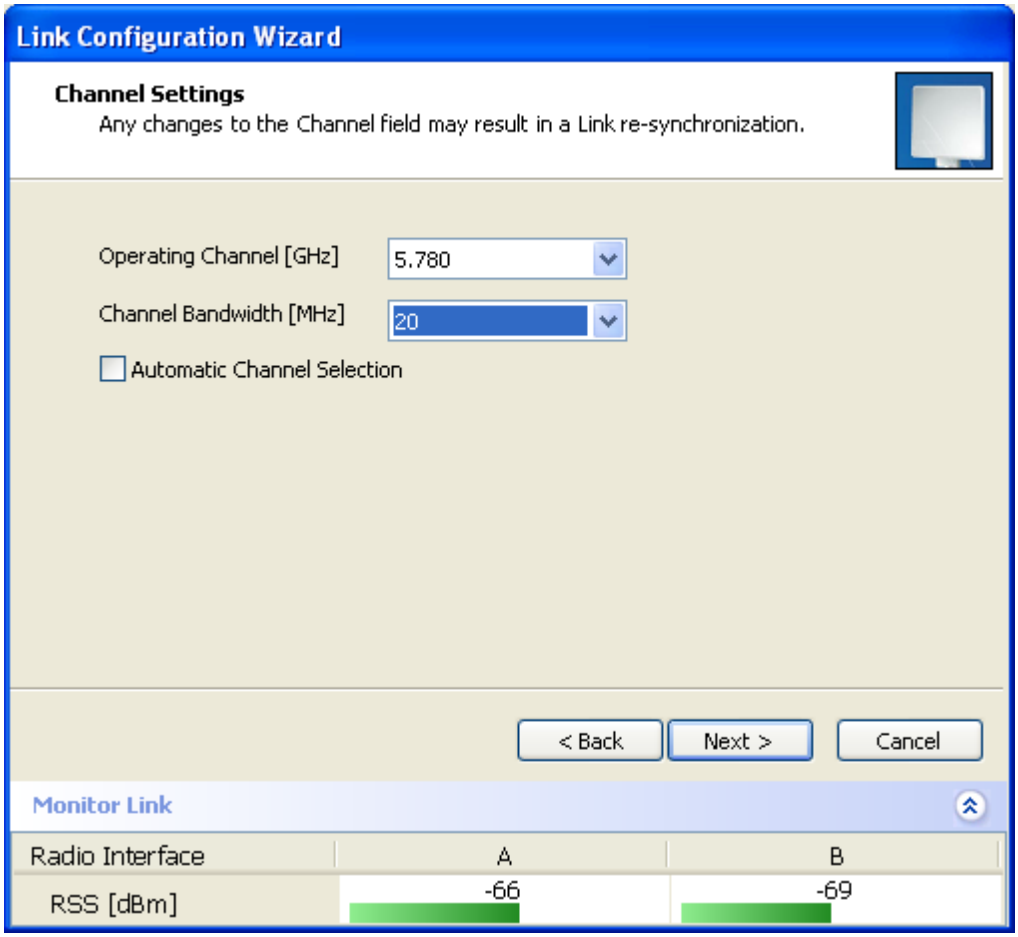


Figure 4-4. Channel Select Dialog Box – Manual Channel Selection

Configuring the Transmit Power and Antenna Settings

You can configure the transmit power and antenna parameters for the local and remote sites. Configuration procedure is the same as during the link installation process, see *Configuring Transmit Power and Antenna Settings* in Chapter 2.

Caution Changing antenna type causes a service break. The service can be restored only by installing the link again.

➤ **To configure the transmit power and antenna settings:**

1. From the Tx Power and Antenna Parameters dialog box, click **Configure** to change Tx power or antenna settings for site A or site B.

   Site A or site B dialog box is displayed.

2. Change Antenna Type, Required Tx Power, Antenna Gain or Cable Loss for the site, as explained in the link installation procedure in Chapter 2.

3. Click **Next**.

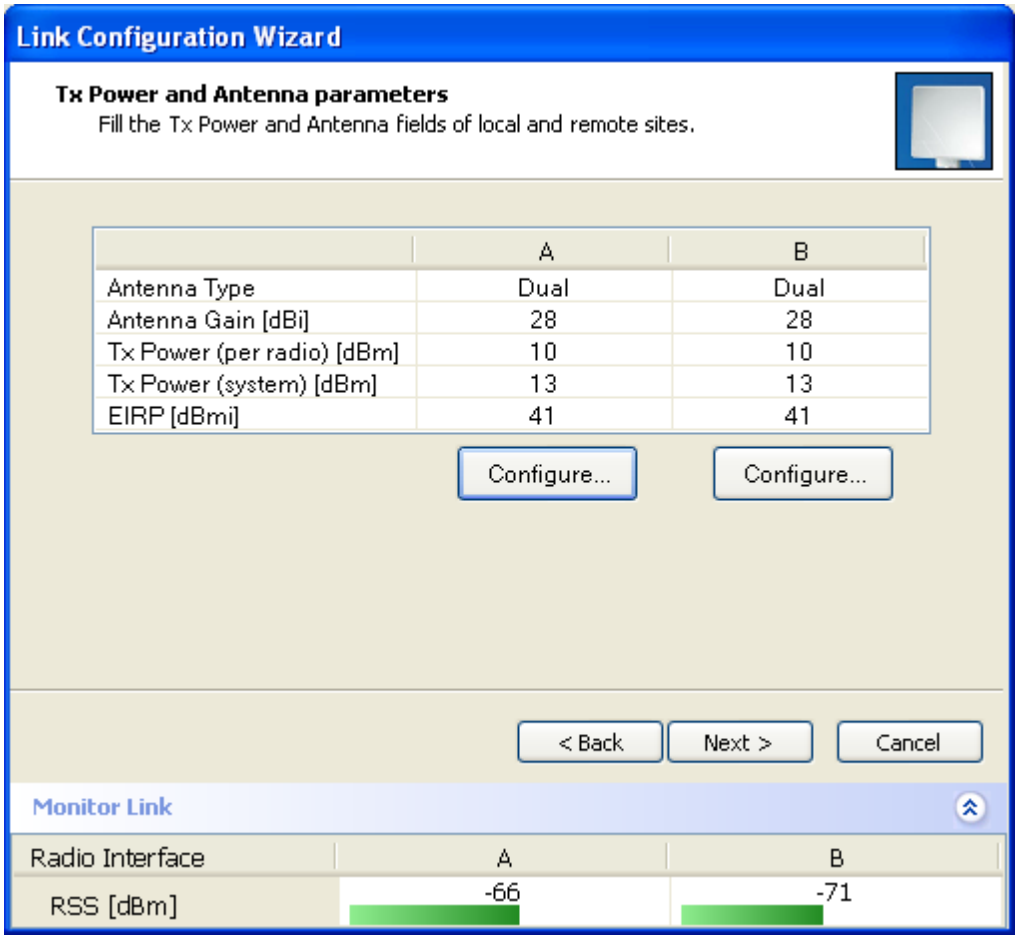


Figure 4-5. Tx Power and Antenna Parameters

Configuring the Services

Currently Ethernet Only is the only available service. You may choose a specific modulation rate or use Adaptive. Configuration procedure is the same as during the link installation process, see *Configuring the Services* in Chapter 2.

➤ **To configure the services:**

1. In the Services dialog box, choose Adaptive or one of the available rates
2. Click **Next** to continue.

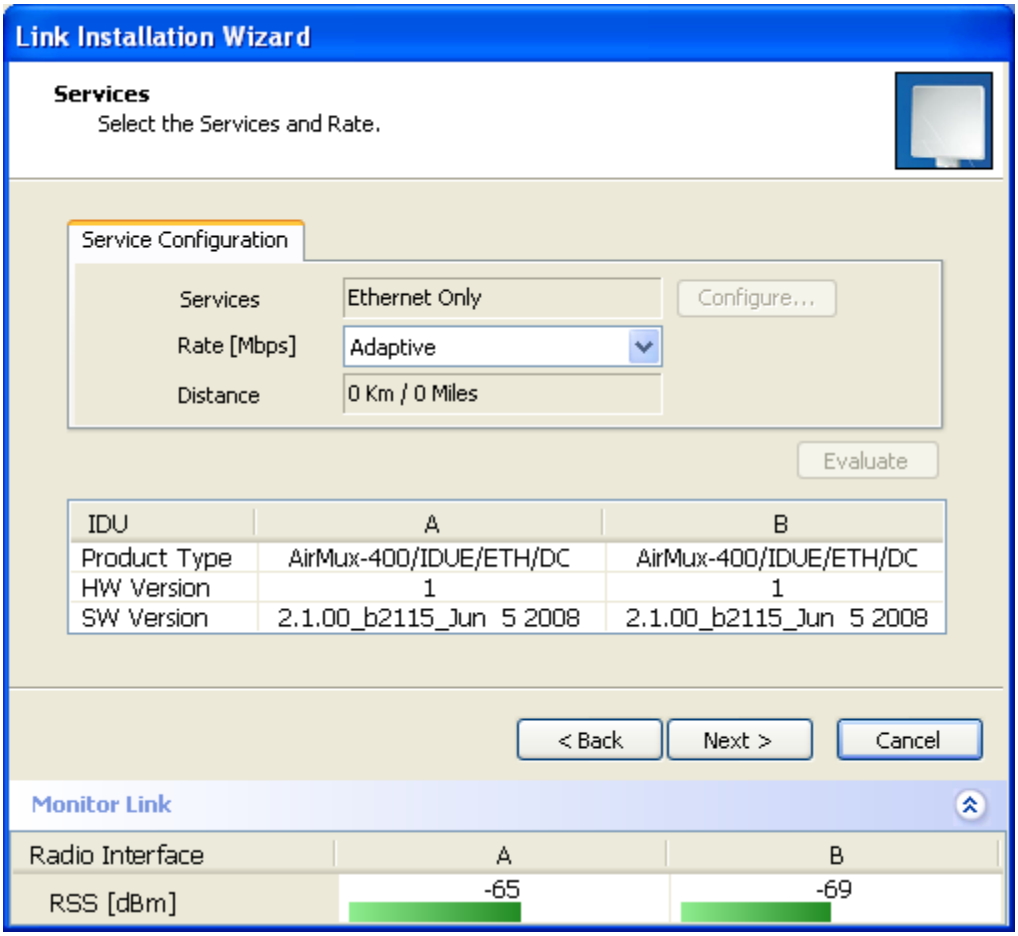


Figure 4-6. Link Installation Wizard, Services Dialog Box

Completing the Link Configuration

The last screen of the link installation wizards allows you to view the configuration summary.

➤ **To complete the link configuration:**

- In the Installation Summary dialog box, click **Done**.

  The main Airmux Manager window is displayed (*Figure 4-8*).

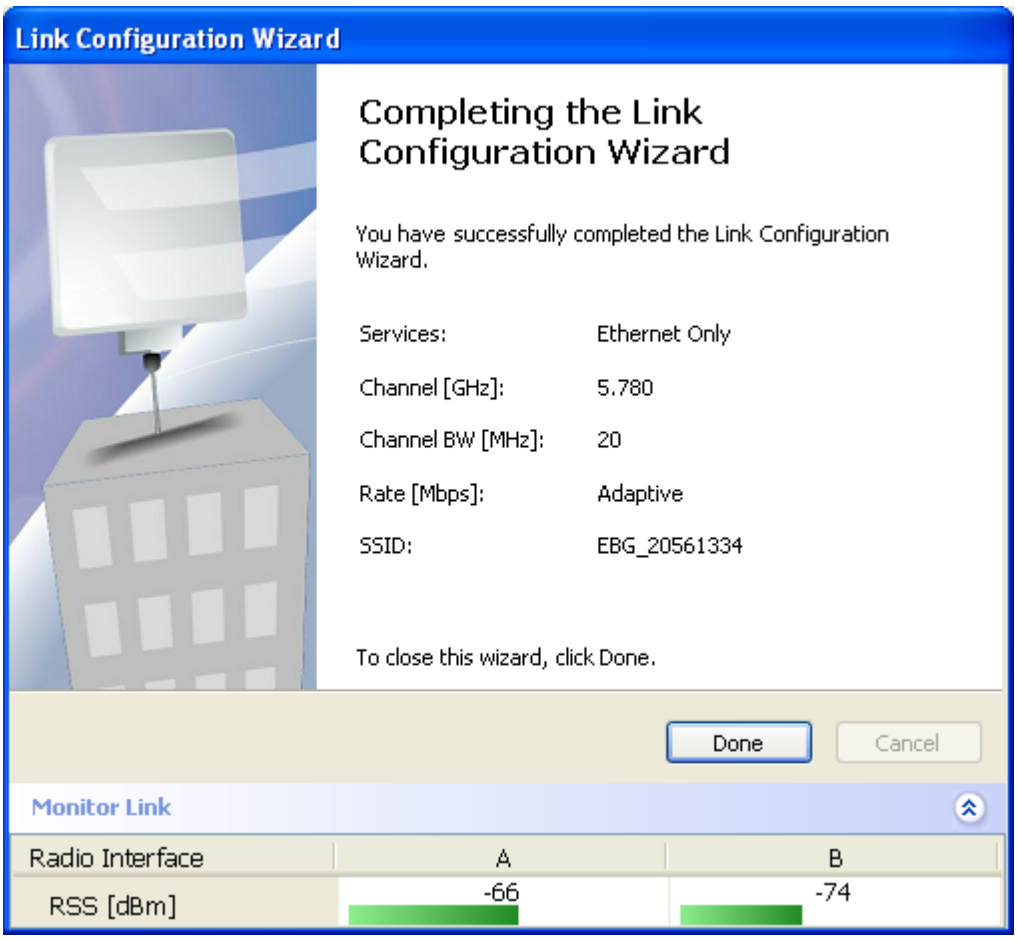


Figure 4-7. Link Configuration Wizard, Final Screen

The Finish screen appears, showing a summary of the link configuration (see *Figure 4-7*).

- Click **Finish** to complete the configuration wizard.

  The Main menu is displayed.

Caution After completing the link setup, change the default IP addresses of the ODUs (see *Defining the Management Addresses* section below.

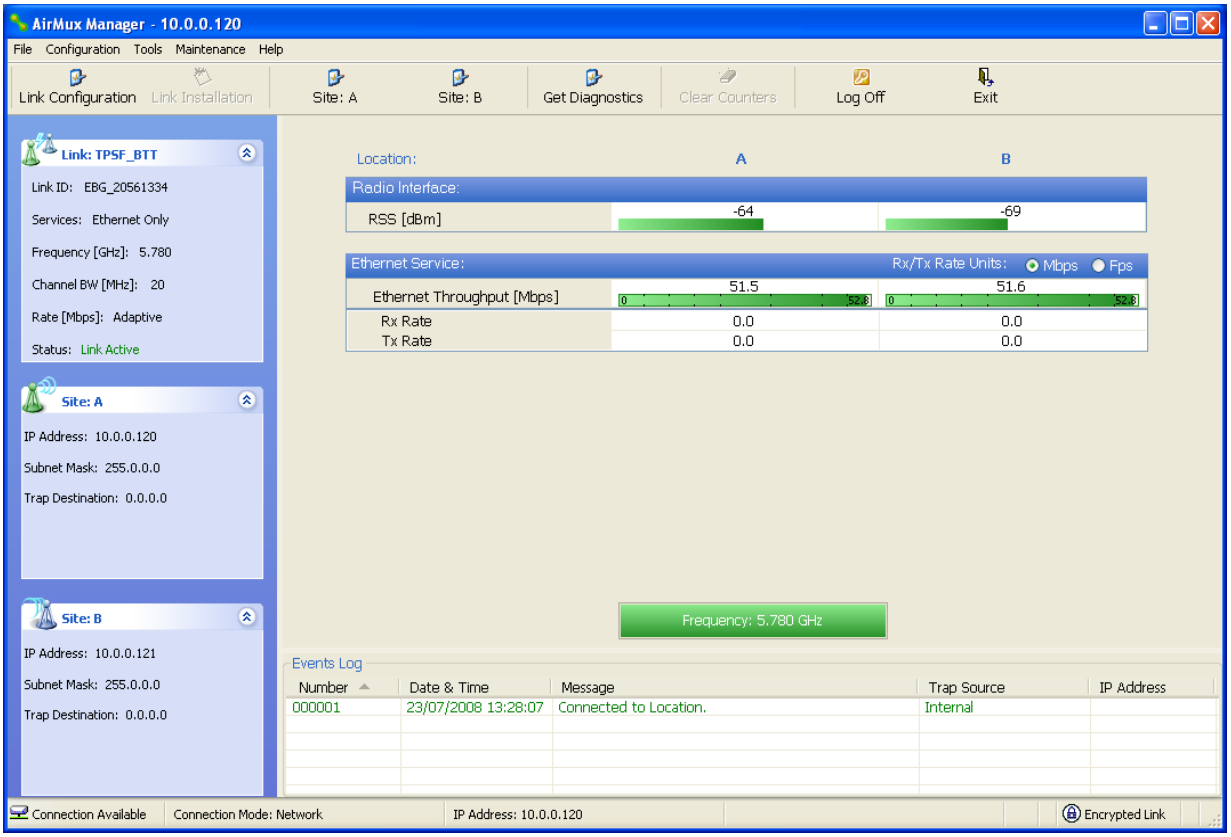


Figure 4-8. Main Window after Link Installation

4.2 Configuring the Sites

You can edit the configuration parameters for each site individually without running a wizard.

From the SConfiguration dialog box, (see *Figure 4-9*) the following functions are available by selecting the items on the left of the dialog box:

System Edit the contact person and location details. View the system details

Air Interface Change the transmit power, cable loss, antenna type and settings

Inventory View the hardware and software inventory (release numbers, model identification, MAC address)

Management Configure the IP address, subnet mask, default gateway, the trap destination and VLAN ID.

Security Change the community values and link password

Date and Time Set the date and time of the link from an NTP servers

Advanced Configure the bridge, define the LAN connection, set the external alarm inputs and restore the unit to the factory settings.

From the Configuration dialog box, the following functions are available by clicking the buttons at the top of the dialog box:

Backup	Save a backup.ini file with the current configuration.
Restore	Load the backup.ini file created by the backup.
Installation Mode	Return to Installation Mode for the entire link. Selecting the Mute check box before clicking the Install Mode button mutes the Beeper.
Mute	Mutes the Beeper at startup. Reactivate the beeper during alignment.

➤ **To configure via the local or remote site:**

1. Click **Configuration** from the main menu.
2. Select which site to configure.

   The Configuration dialog box opens (see *Figure 4-9*).

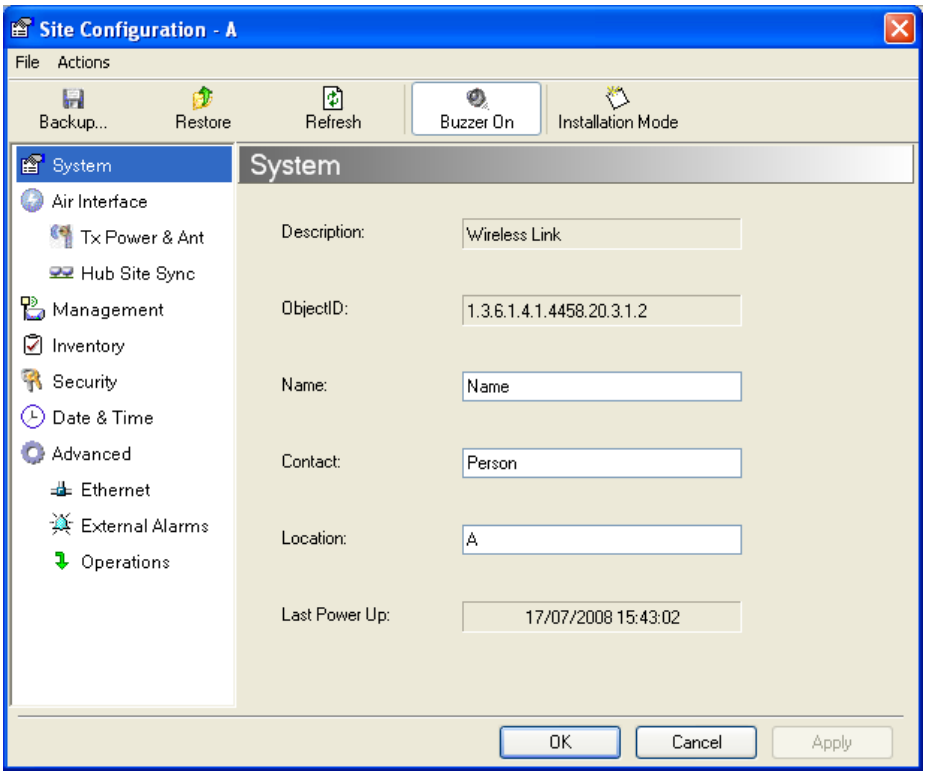


Figure 4-9. System Configuration Dialog Box

3. Select the appropriate item in the left hand list to open a dialog box.
4. Click **Apply** to save the changes.

4.3 Configuring for Management

To allow access to the device (using the Airmux-400 management utility or Telnet), it is necessary to configure its management parameters, including system information, IP address, VLANs (optional) and SNMP communities (optional).

Configuring the System Information

You can assign a name to the system, contact person and location to distinguish it from the other systems at your disposal.

➤ **To configure the system information:**

- From the System dialog box, configure the following:
  - Name – system name
  - Contact – system contact person
  - Location – system location.

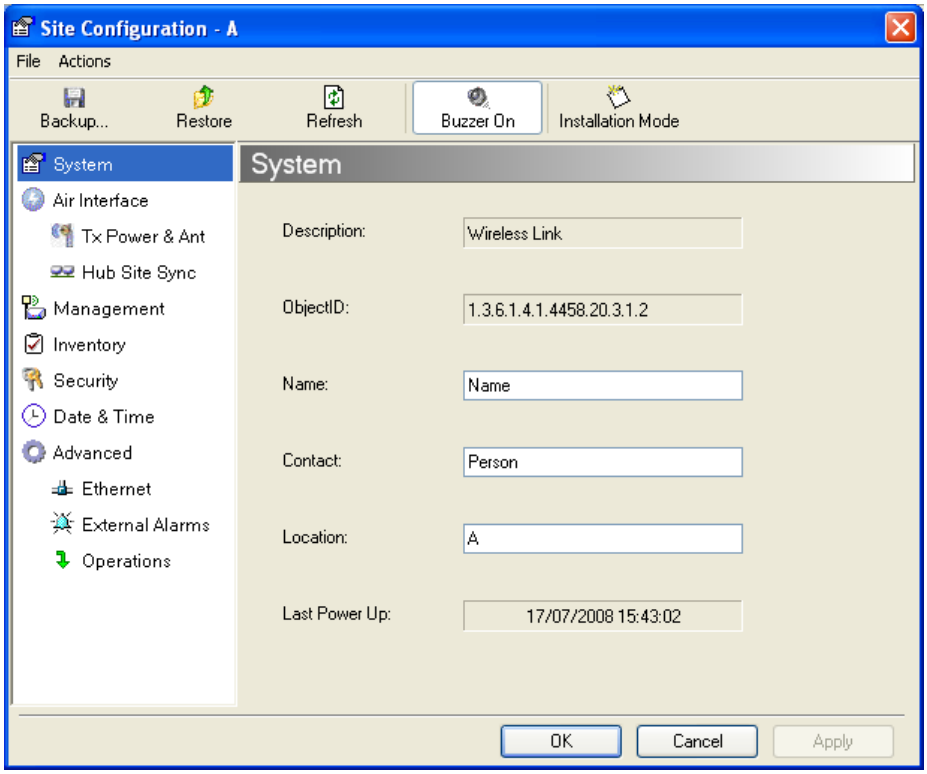


Figure 4-10. Site Configuration, System

Defining the Management Addresses

Each site must be configured separately, first site A then site B.

➤ **To define the management addresses:**

1. Click **Configuration** from the main menu.

2. Select which site to configure.

   The Configuration dialog box opens.

3. Select **Management** (see *Figure 4-11*).
4. Enter the IP address of the ODU in the IP address field.
5. Enter the subnet mask.
6. Enter the default gateway.
7. Enter the trap destination. This is the IP address of the PC running the management application. The event log will be stored at this address.
8. Click **Apply** to save the changes.

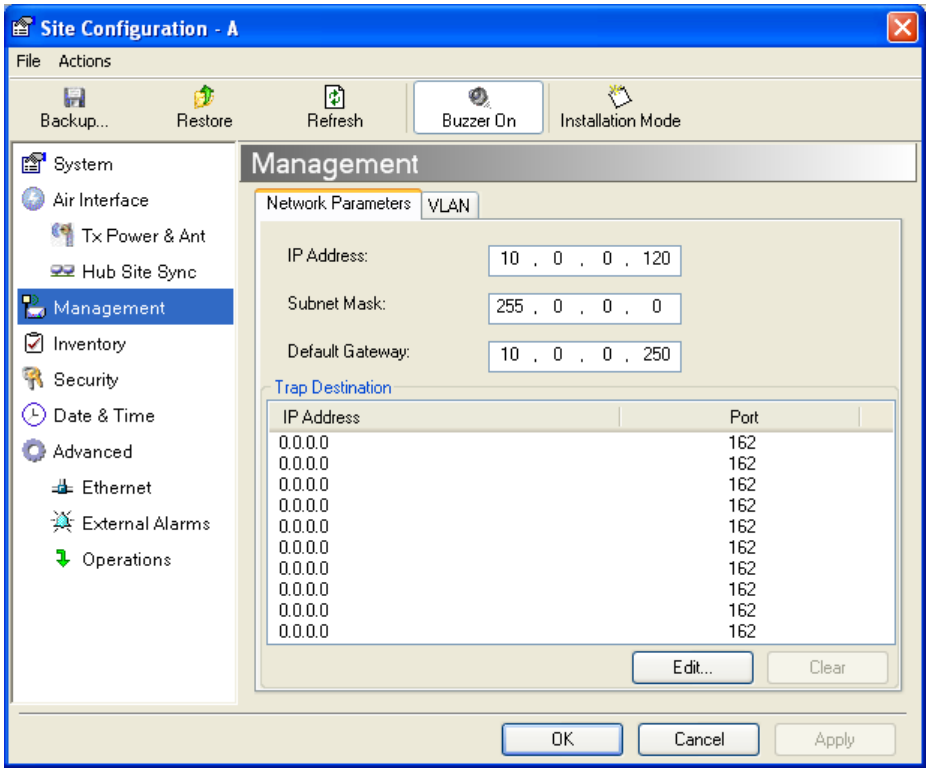


Figure 4-11. Site Configuration, Management

Notes

The Installation mode button opens the Link Installation wizard to reinstall the link. This option must be used only when the radio link is operational. Activation of the installation mode without an active radio link results in a loss of connectivity between two units.

The Backup and Restore buttons are for saving and restoring the configuration files.

Configuring VLAN Management

VLAN management enables the separation of user traffic from NMS traffic. The user decides if such a separation is required. Both sites are configured with VLAN management.

➤ **To enable VLAN management:**

1. Click **Configuration** from the main menu.
2. Select the site to configure.
3. Select **Management**.
4. Open the VLAN tab.
5. Check the **Enabled** box.
6. Enter a VLAN ID.

   After entering the VLAN ID, only packets with the specified VLAN ID are processed by the ODU. This includes all the protocols supported by the ODU (ICMP, SNMP, Telnet and NTP). The VLAN priority is used for the traffic sent from the ODU to the management workstation. VLAN management affects all types of management connections (local, network, and over-the-air).
7. Enter a Priority number.
8. Click **<OK>** to save the settings.

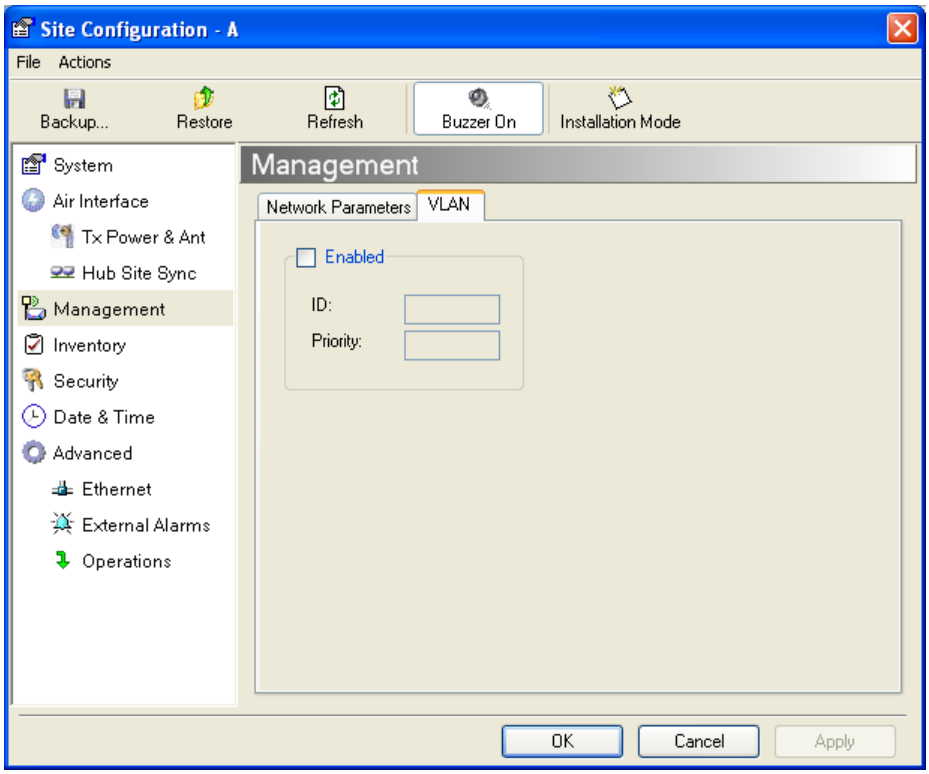


Figure 4-12: Configuring VLAN Settings

Warning

When this parameter is changed, it causes the management application to immediately disconnect. In order to avoid problems, verify the change by setting the VLAN on only one ODU. Only after proper VLAN network operation is verified, the other VLAN setting can be changed.

➤ **To troubleshoot VLAN problems:**

If the VLAN ID is forgotten or no VLAN network is connected to the ODU:

- Reset the device.

  In the first two minutes, neither the VLAN or any VLAN connections are available.

Configuring SNMP Communities

The ODU communicates with the management application using SNMPv1 protocol. The protocol defines three types of communities:

- Read-Only for retrieving information from the ODU
- Read-Write to configure and control the ODU
- Trap used by the ODU to issue traps.

The community string must be entered at login. The user must know the password and the correct community string in order to gain access to the system. A user may have read-only privileges.

It is not possible to manage the ODU if the read-write or the read community values are forgotten. An alternative community key may be obtained from technical support for the purpose of setting new community; the MAC address of the ODU must be supplied.

Note

The manager application and the ODU use the community strings ***public-bru1*** *for the local unit and* ***public-bru4097*** *for the remote unit. These are the factory defaults.*

A new community string can be set if necessary. The read-write community and read-only community have a minimum of five alphanumeric characters. (Bru1 and bru4097 are not permitted). Changing the trap community is optional by clicking the check box.

Editing Community Strings

The community change dialog box is available from the **Configuration > Security** tab. Both read-write and read-only communities must be defined.

On entering for the first time, use **netman** as the current community. The community string can be changed when entering the system for the first time, and the community string **netman** cannot be used again.

➤ **To change a community:**

1. From the Configuration dialog box, select the **Security** tab
2. Type the current read-write community (default is **netman**).
3. Select the communities to be changed by clicking the check box.
4. Type the new community and re-type to confirm.
5. Click **OK** to save.

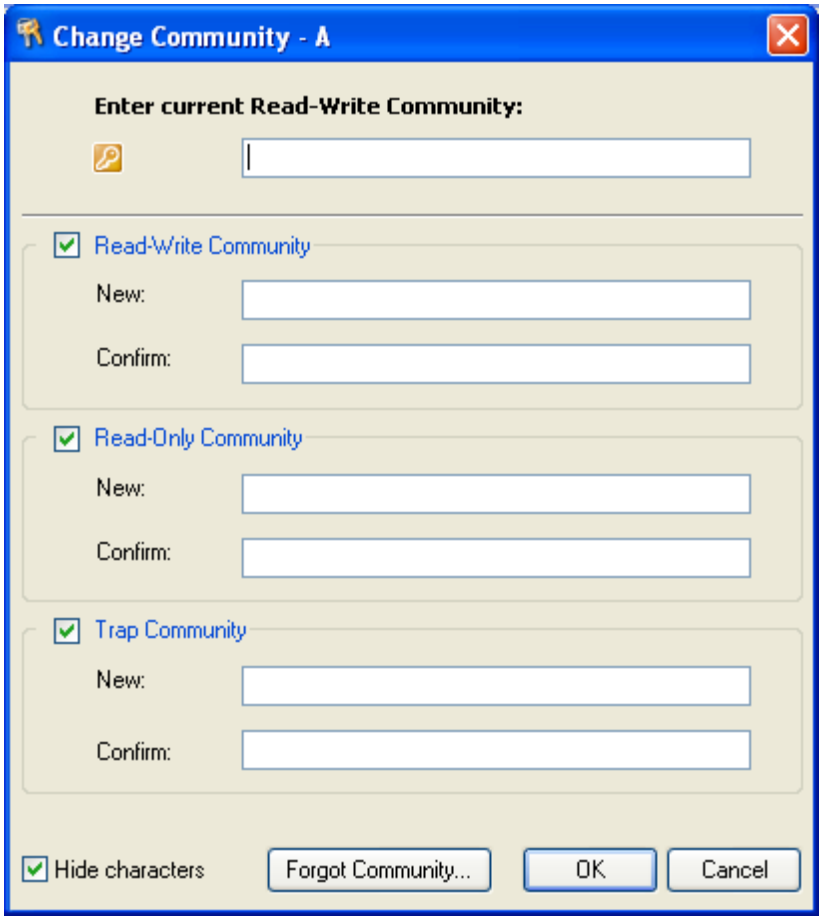


Figure 4-13. Changing the Community String

Restoring Community String

If the read-write community string is unknown, an alternative community key can be used. The alternative community key is unique per ODU and can be used only in order to change the community strings. The alternative community key is supplied with the product, and it is recommended to keep it safe.

If both the read-write community and the alternative community key are unavailable, then an alternative community key can be obtained from customer support using the ODU MAC address. The MAC address is displayed in the manager inventory tab.

When you have the alternative community key, click the **Forgot Community** button and enter the Alternative Community (*Figure 4-14*). Then reconfigure the read-write community string.

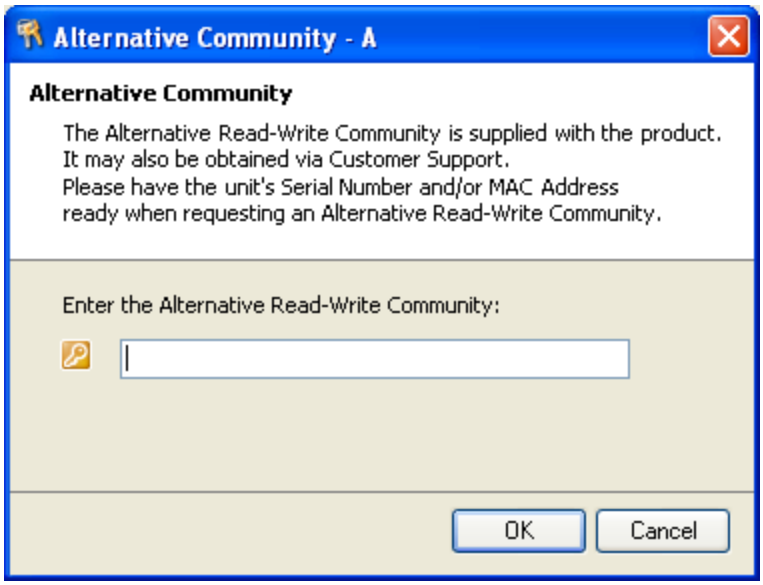

Alternative Community - A
Alternative Community
The Alternative Read-Write Community is supplied with the product.
It may also be obtained via Customer Support.
Please have the unit's Serial Number and/or MAC Address
ready when requesting an Alternative Read-Write Community.
Enter the Alternative Read-Write Community:
OK
Cancel

Figure 4-14. Alternative Community Dialog box

4.4 Configuring for Operation

Changing the Transmit Power

Each site can have a different transmit power level.

➤ **To change the transmit power:**

1. Click **Configuration** from the main menu.
2. Select which site to configure.

   The Configuration dialog box opens.
3. Select Air Interface (see *Figure 4-15*)
4. Select the required Transmit Power Level (see *Configuring Transmit Power and Antenna Settings* in Chapter 2).
5. Click Apply to save the changes.

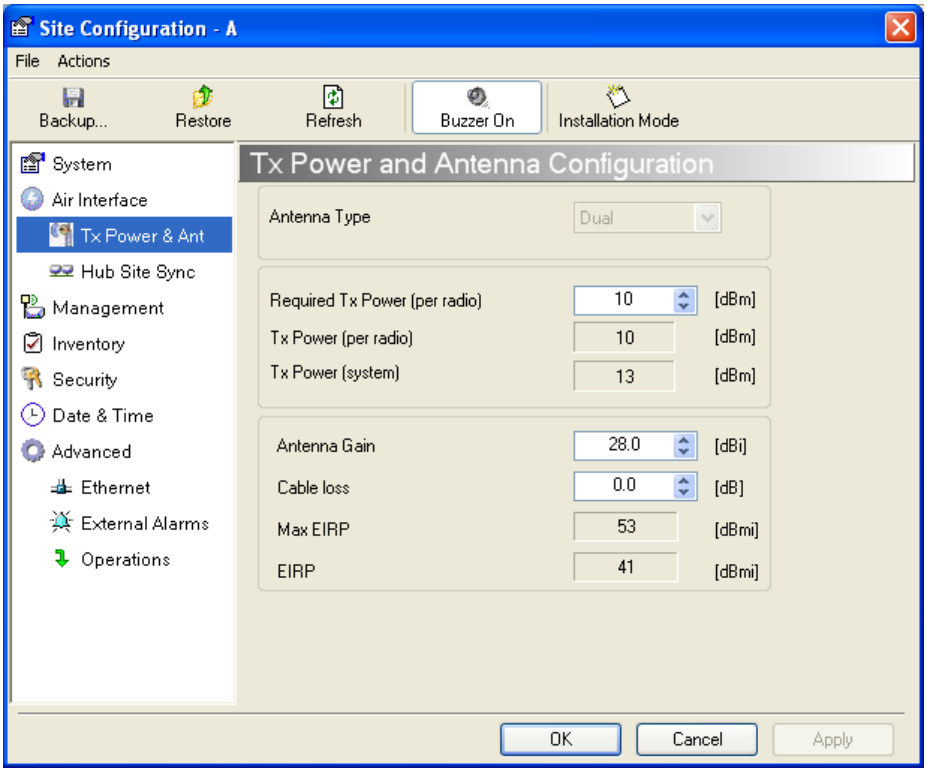


Figure 4-15. Changing the Transmit Power

Configuring Ethernet Ports

The Ethernet ports are configurable for line speed (10/100BaseT) and duplex mode (half or full duplex). Airmux-400 provides an Auto detect feature where the line speed and duplex mode are detected automatically using autonegotiation. Use the manual configuration when external equipment does not support autonegotiation. The default setting is Auto Detect. (See *Figure 4-16*).

The maximum Ethernet Information Rate can be limited via the pull down menu. The default setting is Not Limited.

Note

It is not recommended to configure the port that is used for the management connection, since a wrong configuration can cause management disconnection or Ethernet services interruption.

➤ **To configure the Ethernet mode:**

1. From the **Configuration** menu, select the site to reconfigure.

   The Site Configuration dialog box opens.

2. Click **Advanced** › **Ethernet**.
3. In the Ethernet Ports Configuration pane, use the drop-down menu to select the LAN configuration.
4. Click **Apply** to save the changes.

Note

*It is possible to close the Ethernet service by disconnecting the Ethernet port. (**Disable** option in LAN port mode configuration) The user should be aware that it is possible to close the port and not have any access to the device. If this should occur the workaround is as follows:*

- *Connect the system from the remote site*
- *Connect via other Ethernet port (IDU-E)*
- *Power down the equipment and connect immediately after the power up (the fastest way is to enter install mode).*

Configuring the Bridge

ODU bridge configuration is required in various network topologies, such as protection (1+1) and ring application. The bridge configuration parameters are located under the Advanced tab of the Configuration dialog box (*Figure 4-16*).

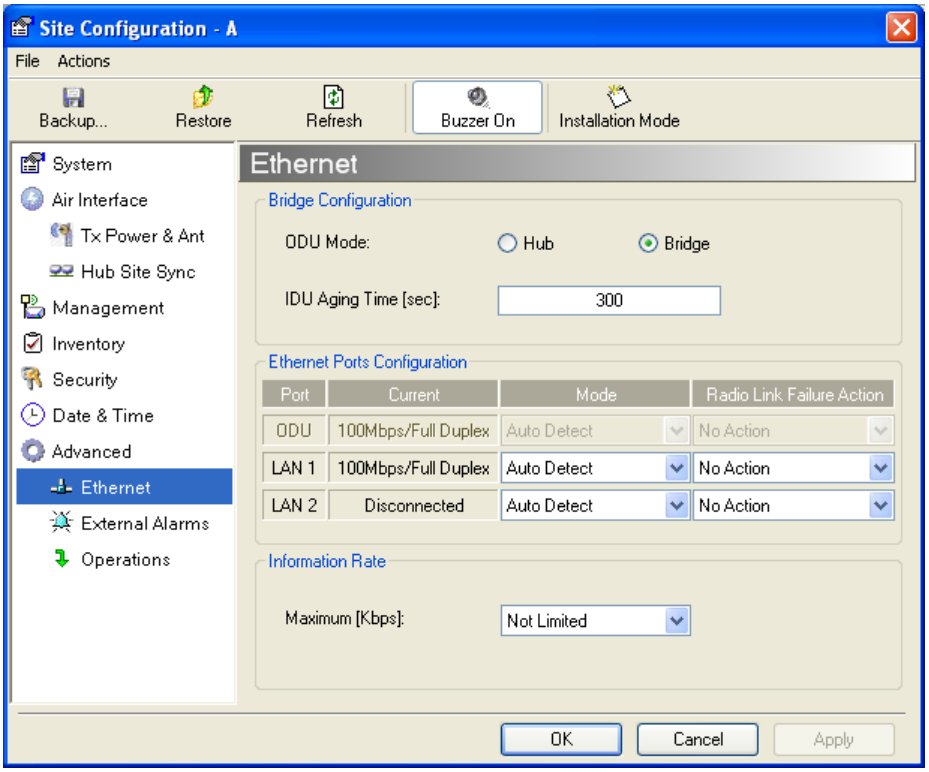


Figure 4-16. Advanced Configuration-Ethernet

Selecting the ODU Bridge Mode

This parameter controls the ODU mode with two optional values,

- Hub Mode – in Hub mode the ODU transparently forwards the all the packets over the wireless link.
- Bridge Mode – In Bridge mode the ODU performs both learning and aging, forwarding only relevant packets over the wireless link. The aging time of the ODU is fixed at 300 seconds.

Note

Changing these modes requires system reset.

Defining the IDU Aging Time

This parameter controls the IDU aging time.

The IDU has a 2047 MAC address-learning table. The aging time parameter controls the time each MAC address is dropped from the table.
Default value is 300 seconds.

Notes *Any change to these parameters is effective immediately.*
Each side of the link can be configured separately.

The following list details common configurations; both sides are must be configured with the same parameter.

- Standard (Default) Configuration for Ethernet Applications with the IDU unit
  Set IDU aging to 300 seconds, ODU set to Hub mode, *Figure 4-16*.
- Standard (Default) Configuration for Ethernet Applications with PoE unit
  ODU set to Bridge mode, IDU aging is not applicable.
- Fast aging mode – for rapid network topology changes
  Set IDU aging to one second, ODU set to Hub mode.
- Hub Mode
  The ODU is set to HUB mode. IDU aging is not applicable.
- Ethernet Bridge
  The ODU is set to Bridge mode. The IDU aging is not applicable.

Setting the Maximum Information Rate

The maximum Ethernet throughput of the link can be limited. The default setting is Best Effort, where the highest information rate available for the link conditions and settings is used (see *Figure 4-16*).

➤ **To set the Ethernet information rate:**

1. From the **Configuration** menu, select the site to reconfigure.

   The Configuration dialog box opens.

2. Click **Advanced > Ethernet**
3. In the Information Rate pane, use the drop-down menu to select the maximum Information Rate.
   - Select **Other** to define the throughput with 1 kbps resolution
   - Select **Not Limited** for the highest information rate possible for the link conditions and settings.
4. Click **Apply** to save the changes.

4.5 Performing Additional Tasks

This section describes additional operations supported by the Airmux-400 management software, including the following:

- Displaying inventory
- Changing passwords
- Setting date and time
- Configuring external alarm inputs
- Reinstalling the wireless link
- Configuring link security
- Muting the beeper
- Resetting the unit.

Displaying the Inventory

➤ **To view the inventory data:**

1. Click **Configuration** from the main menu.
2. Select which site to configure.

   The configuration dialog box opens.
3. Select **Inventory** (*Figure 4-17*).

Note

This screen is for viewing purposes only.

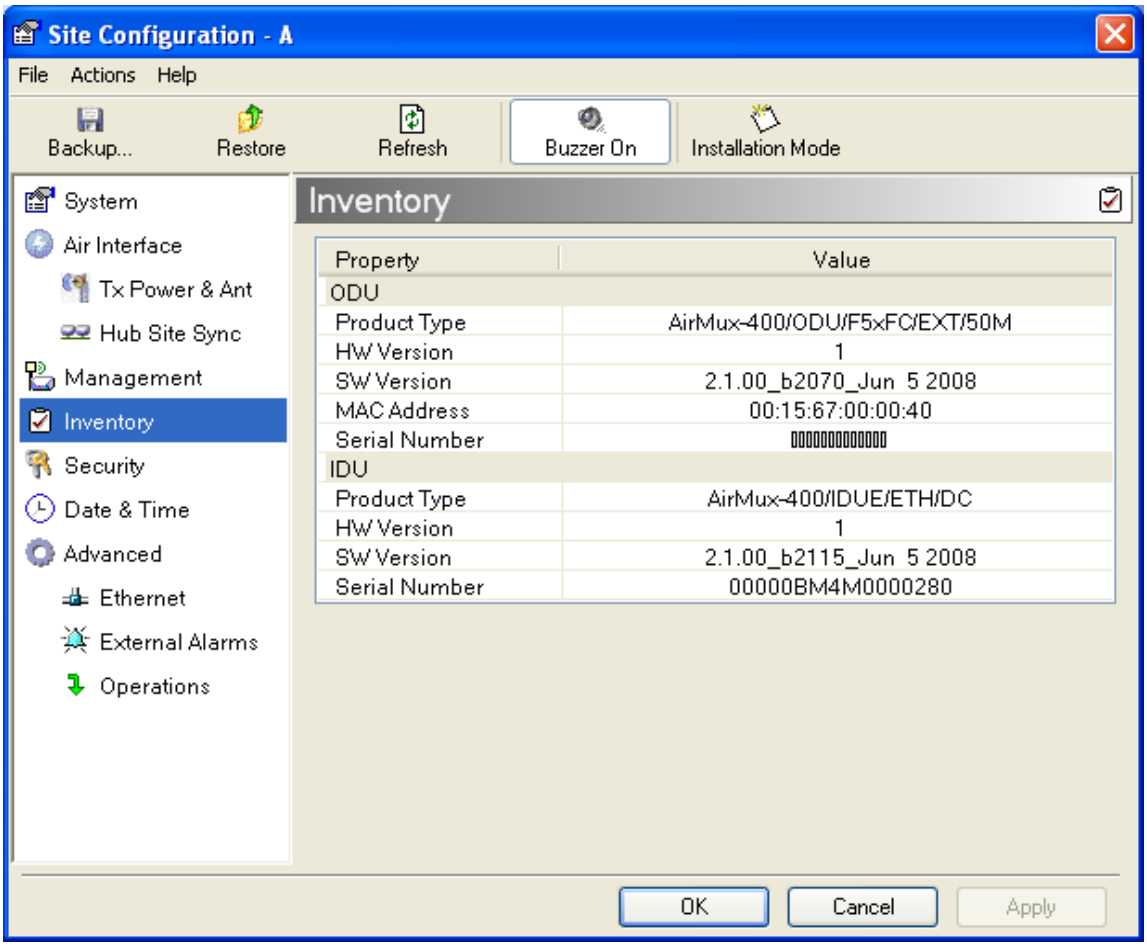


Figure 4-17. Inventory Screen

Changing Passwords

There are two passwords necessary to use the Airmux-400 system. The first is encountered when running the management software, the second, the link Password is used for encryption purposes and is found when installing or configuring the link.

Changing the Management Password

➤ **To change the management password**

1. From the Tools menu, select Change Password
2. The Change Password dialog box appears.
3. Enter current password, and new password.
4. Click **OK** to confirm.

Changing the Link Password

Airmux-400 Radio Link is encrypted using Advanced Encryption System (AES) using a 128 bit dynamic key. During the installation process a Link Password must be set. An Initial encryption key is generated. Each time a link is established the Encryption key is validated. If the validation failed the link is established but no service or configuration is allowed. In this state the user can change the link password of each of the sites.

➤ To change the link password:

1. From the Configuration dialog box, select the **Security** tab
2. Click **Change** next to the Link Password field box.

   The Change Link Password dialog box appears.
3. Enter the current link password.
4. Enter the new password.
5. Enter the new password again in the Confirm box.

Restoring Link Password

In case of a forgotten link password, the user may enter the key password supplied with the product. The key password may be obtained from customer support after validation of the device MAC address. The user may change the link password of both sides of the link at any time using the Link Configuration Wizard.

➤ To enter the key password:

1. From the Configuration dialog box, select the **Security** tab.
2. Click **Change** next to the Link Password field box.

   The Change Link Password dialog box appears.
3. Click the **Forgot Link Password** button.

   The Key Link Password dialog box appears.
4. Type the key link password.

   A new link password may now be set.

Setting the Date and Time

The ODU maintains a date and time value. The date and time value can be synchronized with any Network Time Protocol (NTP) version 3 compatible server. (Windows XP is configured by default as a server.) On power-up the ODU configures the initial date and time using an NTP server. If the server IP is not configured or is not reachable, a default time is set. When configuring the NTP server IP, you should also configure the offset from the Universal Coordinated Time (UTC). If there is no server available, you can either set the date and time, or you can set the manager workstation time. Note that manual setting is not recommended since reset, power up, or synchronization with an NTP server will override the setting.

Note

- *The NTP uses UDP port 123. If a firewall is configured between the ODU and the NTP server this port must be opened.*
  (Windows XP command w32tm /stripchart /computer:<server IP> can be use to check the NTP server connectivity).
- *It can take up to 8 minutes for the NTP to synchronize the ODU date and time.*

➤ **To set date and time:**

1. Click **Configuration** from the main menu.
2. Select which site to configure.

   The Configuration dialog box opens.
3. Select Date & Time (see *Figure 4-18*).

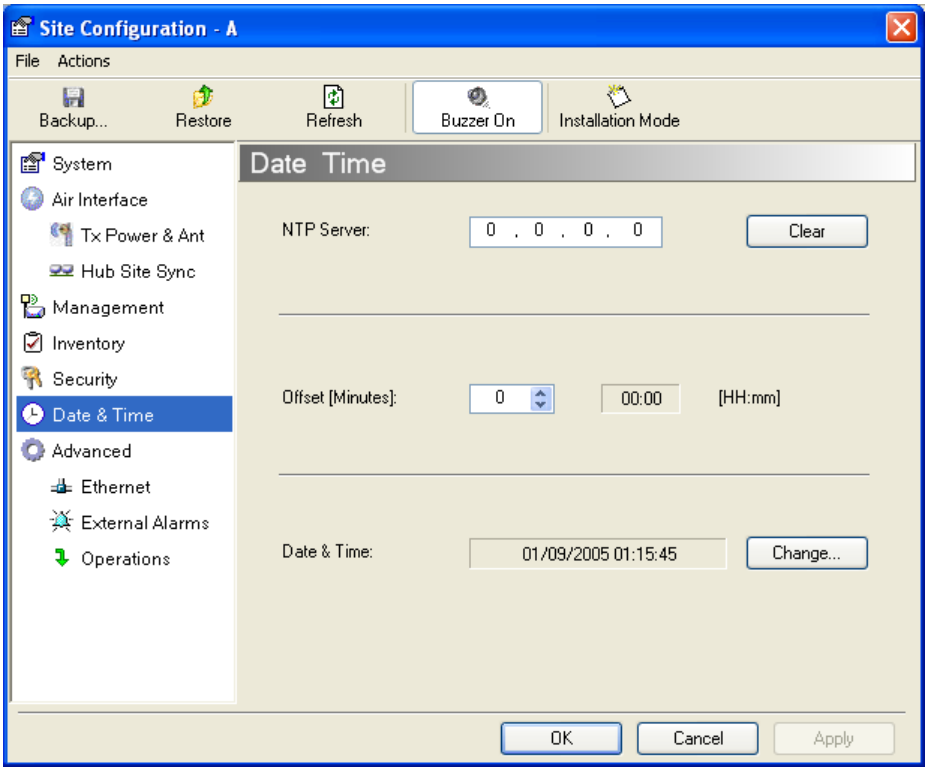


Figure 4-18. Date & Time Configuration

4. If entering an address for the NTP Server, click **Clear**, and then enter the new address.
5. Set the Offset value (minutes ahead or behind the GMT).
6. To manually set the date and time, click **Change** (*Figure 4-19*) and edit the new values. The ODU time can be locked to a PC clock by checking the corresponding box appears on the Change screen.

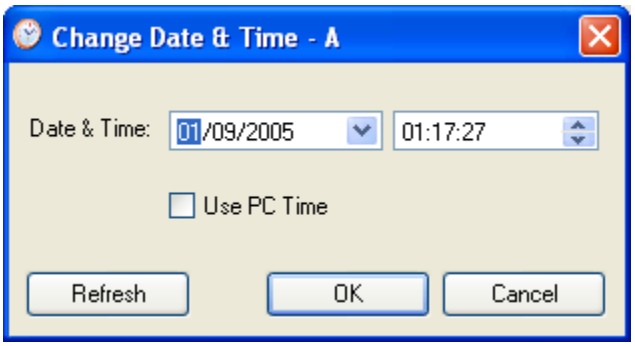


Figure 4-19. Manually Changing Date and Time

4.6 Muting the Beeper

The ODU beeper starts beeping as soon as power is supplied, and continues until the ODUs are aligned and the link established.

It is possible to mute the beeper until the alignment procedure is to be performed.

➤ **To mute the beeper:**

1. Click on **Configuration** in the Menu bar and select the relevant site.

   The Configuration dialog box opens.

2. In the Configuration dialog box, click the **Buzzer** button. The button toggles between on and off.

   The Beeper stops.

➤ **To restore the beeper:**

1. Click **Configuration** in the Menu bar and select the relevant site.

   The Configuration dialog box opens.

2. In the Configuration dialog box, click the **Buzzer** button. The button toggles between on and off.

   The Beeper starts.

Setting External Alarm Inputs

The IDUE has two external alarm inputs and two external alarm outputs in the form of dry-contact relays. The Alarm port is located on the front panel of the IDUE and is a 25-pin D-type female connector, see *Appendix A* for the pinout. The user enables or disables each of the alarms and can configure the text that appears in the alarm trap. The ODU sends the alarm within less than a second from actual alarm trigger.

➤ **To set the external alarm inputs:**

1. Open the Site Configuration Alarms configuration by clicking **Configuration > Advanced > External Alarms.**

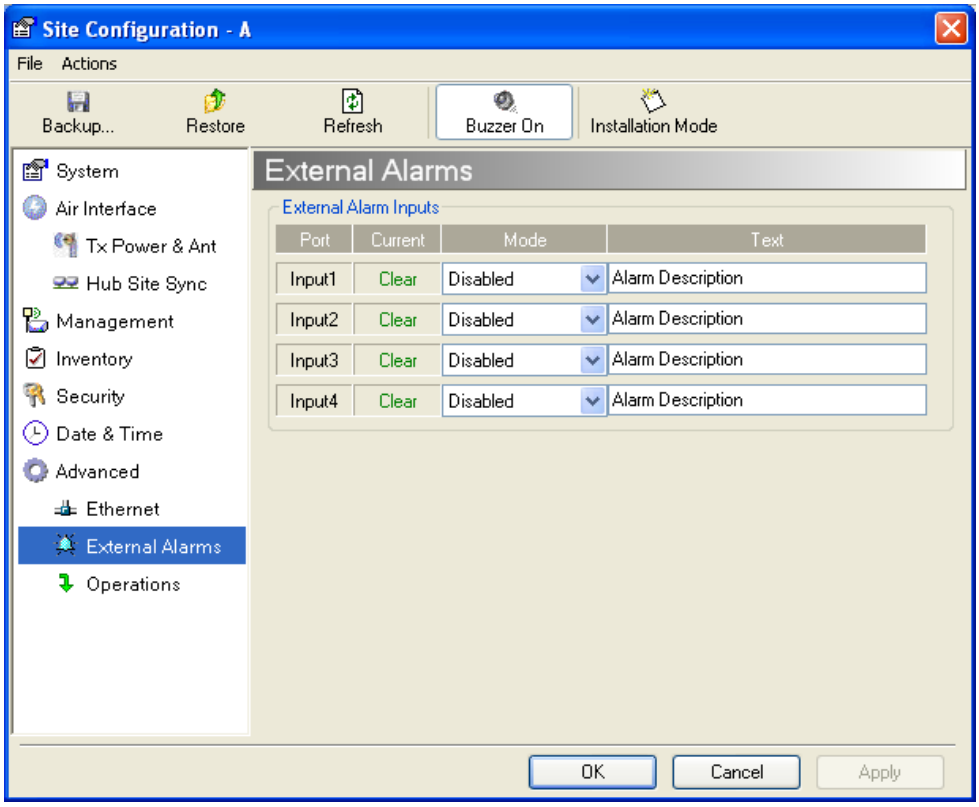


Figure 4-20. External Alarm Configuration

2. Enter a description of the alarms in the fields.
3. Click **Apply** to save.

Managing Configuration Files

Saving the Airmux-400 Configuration in a File

Airmux-400 management software allows you to save configuration parameters of the local and remote units on the management station as an INI file. Each site is saved in a separate INI file.

➤ **To save the configuration in a file:**

1. Click **Configuration** from the main menu.
2. Select which site to backup.

   The configuration dialog box opens.
3. Click **Backup**.
4. In the Save As dialog box, indicate in which folder and under what name configuration file is to be saved, and click **Save**.

Restoring a Configuration File

Configuration files (***.ini**) can be uploaded from the management station. Verified configuration files can be distributed to other units that use the same configuration.

➤ **To restore a configuration file:**

1. From the **Configuration** menu, select the site to reconfigure.

   The Configuration dialog box opens.

2. Click **Restore**.
3. From the Open dialog box select ***.ini** file to upload and click **OK**.

Reinstalling the Link

It may be necessary to reinstall the link if the ODUs should need to be realigned.

Note *Activating the Installation Mode causes disruption in service for approximately 15 seconds.*

➤ **To reinstall the link:**

1. Click **Configuration** in the Menu bar and select any one of the sites.

   The Configuration dialog box opens.

2. Click the **Installation Mode** button in the Configuration dialog box.

   A message box asking if you want to enter install mode appears.

3. Click **Yes** to continue.

   Airmux-400 enters install mode and the beeper starts beeping.

4. Realign the ODUs and complete the Installation wizard (see *Chapter2*).

Resetting Airmux-400

Note *Resetting the link causes service disconnection.*
In order to maintain the link configuration, reset the remote Airmux-400 first.

➤ **To reset Airmux-400:**

1. From **Maintenance,** reset the remote Airmux-400.
2. From **Maintenance,** reset the local Airmux-400.

➤ **To reset to factory defaults:**

1. Click **Configuration** in the Menu bar and select any one of the sites.

   The Configuration dialog box opens.

2. Select **Operations** in the Configuration dialog box.
3. Click the **Restore Defaults** button.

   A message box asking if you want to restore factory default appears.

4. Click the check box if you want to keep the current IP settings.
5. Click **Yes** to continue.

Chapter 5

Monitoring and Diagnostics

This chapter describes the Airmux-400 diagnostic functions, which include:

- Monitoring performance
- Detecting problems
- Handling events
- Troubleshooting
- Replacing an IDU
- Frequently asked questions
- Technical support.

5.1 Monitoring Performance

Airmux-400 constantly monitors traffic over the radio link and collects the following statistics data:

- Site 1/Site 2 received traffic rate (in Mbps)
- Site 1/Site 2 received frames rate (in Mbps)
- Radio signal strength (in dBm)
- Error (Blocks).

The statistics (monitor) log and event log can be saved as TXT files. New alarms are automatically added to the text file, as they enter the event log.

Viewing Performance Reports

The Performance Monitor Report displays performance views of each of the interfaces (see *Figure 5-1*) (Ethernet performance is not collected in PoE systems.) Several performance data are collected for each of the interfaces (ES, SES, and UAS), as well as Specific data per Interface type (e.g., TX and RX bytes for Ethernet). For the Air Interface, user defined thresholds data are collected. Refer to *Table 5-1* and *Table 5-2*.

Data is collected and selectively displayed based on three time intervals as selected by the **Interval** radio buttons:

- Current (t=0)

- 15 minutes Intervals
- Daily.

UAS – This parameter counts the time the air link was not providing any service. There are several possible reasons for this situation; one of the sites has a power failure, high interference, maintenance operation, etc.

Radio **BBER** Threshold – This parameter counts the seconds in which the radio performance is below a user specified threshold. The threshold is measured in percent. The threshold can be set from 0.1% up to 50%.

For links with Ethernet only service, 8% threshold is recommended and not 1% meaning that for 8% threshold, the recommended BBER value should be 0 if there are no problems during the 15 min interval. Since Airmux-400 provides a loss less Ethernet service, there is throughput degradation in case of interference. The degradation is proportional to the BBER.

The Radio RSS Threshold can also be used to indicate problems in the radio channel. The expected RSS can be verified by means of the Link Budget Calculator. A value of -5dB from the current RSS is recommended as a threshold.

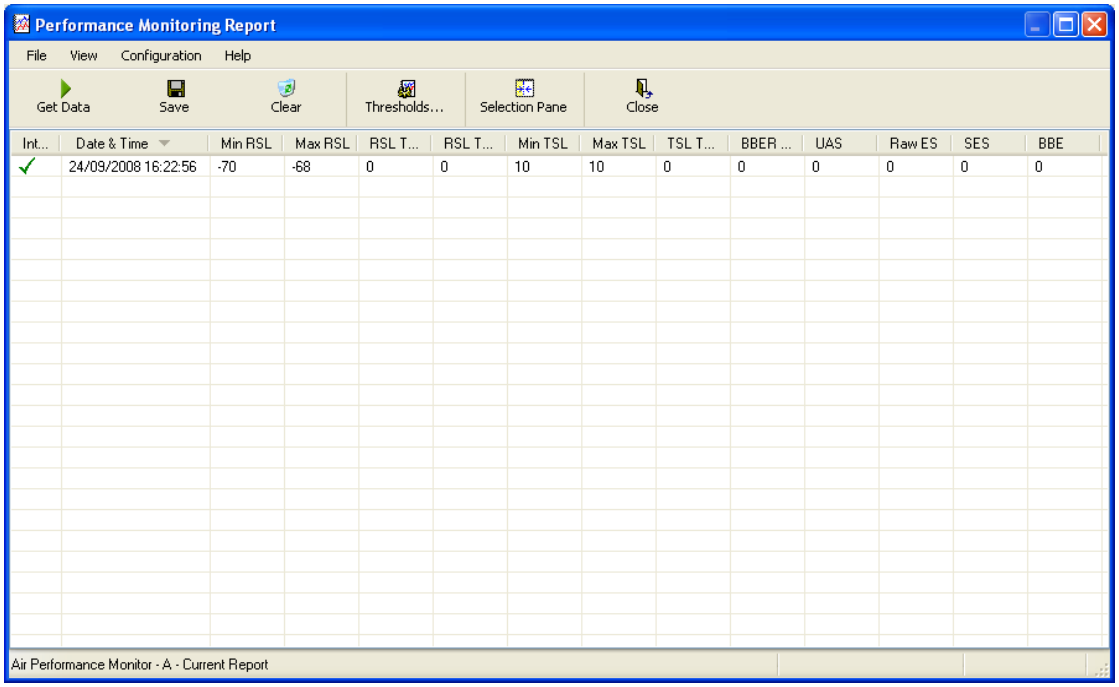


Figure 5-1. Performance Monitoring Report Window

Table 5-1. Explanation Of Performance Data

Data type	Reported value	Explanation
Generic PM Data	UAS – Unavailable Seconds	Seconds in which the interface was out of service.
	ES – Error Second	The number of seconds in which there was at least an error block. Note that notation of an error block is different per interface.
	SES – Severe Error Second	The number of seconds in which the service quality is low (the actual BBER ratio varies per interface).

Data type	Reported value	Explanation
	BBE – Background Block Error	The number of error block in an interval.
	Integrity	A flag indicating that the data is valid. Note that the PM data is not valid if not all the values were stored. (Possible reasons are: clock changes within the interval and Power up reset)
Air Interface PM Data	Max RSL	The maximum of the receive signal level (measured in dBm).
	Min RSL	The minimum of the receive signal level (measured in dBm).
	Max TSL	The maximum of the transmit signal level (measured in dBm). (The transmit power is fixed. The value can be changed only by user configuration)
	Min TSL	The minimum of the transmit signal level (measured in dBm).
	RSL Threshold 1	This parameter counts the number of seconds in which the RSL is below the specified threshold.
	RSL Threshold 2	This parameter counts the number of seconds in which the RSL is below the specified threshold.
	TSL Threshold 1	This parameter counts the number of seconds in which the RSL is above the specified threshold.
	BBER Threshold	The BBER Threshold value counts the number of seconds in which the Background Block Error Ratio (BBER) exceeds the specified threshold.
Ethernet Interface PM Data	Received Bytes	The number of Mega bytes received in the specified port within the interval
	Transmitted Bytes	The number of Mega bytes received in the specified port within the interval.

Table 5-2. Action Of The Tool Bar Button Commands

Button	Action
Get Data	Uploads the selected report from the ODU.
Save	Saves the data in a CSV or Text format for additional analysis.
Clear	Removes the current data from the window.
Selection pane	Selects the site, interface, and interval to be displayed.
Threshold	Opens the threshold configuration dialog box (*Figure 5-2*) to set the Air Interface thresholds. Note that threshold change is effected immediately, but it does not change any historical data.
Close	Closes the Performance Monitor Report window.

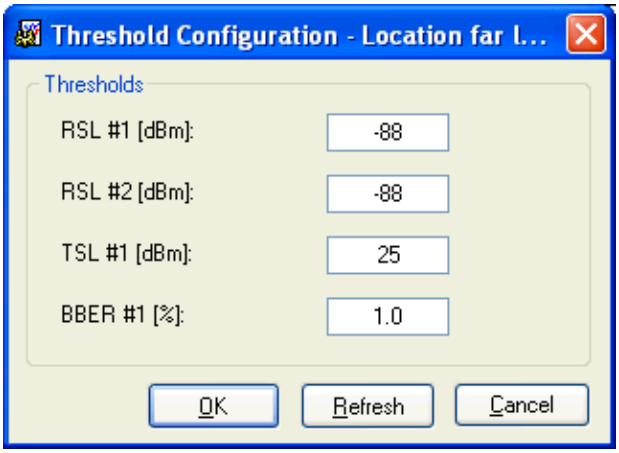


Figure 5-2. Threshold Configuration Dialog Box

Saving the Monitor Log

➤ **To save the monitor log:**

1. From the **Tools** menu, choose **Preferences**.

   The Preferences dialog box appears (see *Figure 5-3*).

2. Click the **Monitor** Tab.
3. Select the file to save.
4. Click the check box to open the file for saving.
5. Click the ... button and in the Select File dialog box indicate in which folder and under what name the alarm log file is to be saved.
6. Set the time interval for adding data to the file.
7. Click **OK** to save the file.

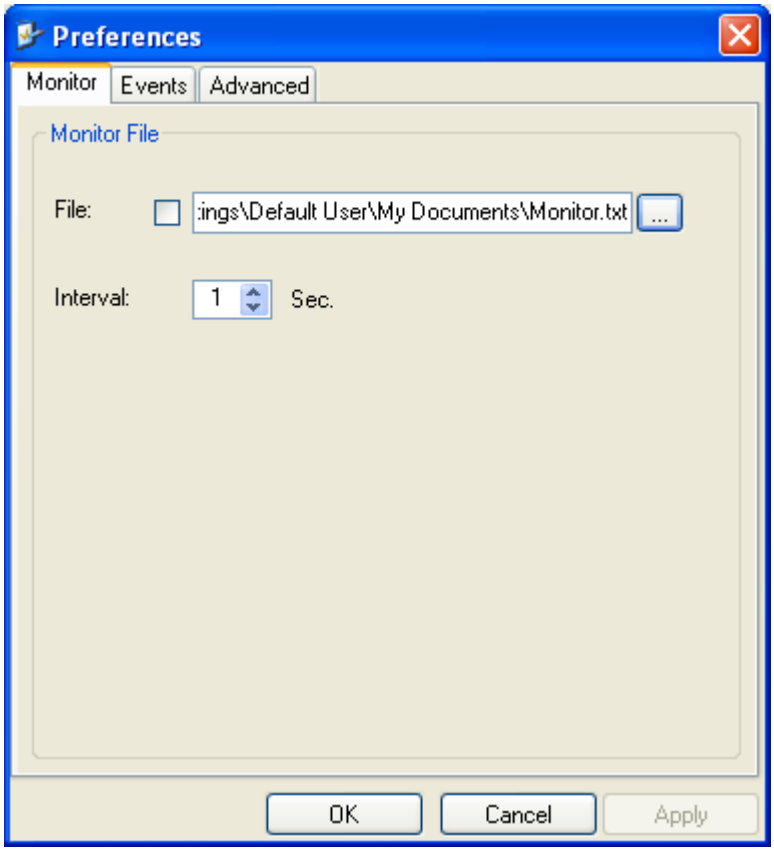


Figure 5-3. Preferences Dialog Box, Monitor Tab

5.2 Detecting Problems

Airmux-400 employs the following error and fault detection methods:

- Self-test
- LEDs
- Alarms and traps
- Statistic counters
- Link compatibility check
- Remote power fail indication
- Automatic link data collection.

Self-Test

Airmux-400 performs a hardware self-test upon turn-on. The self-test sequence checks the critical circuit functions of the device. The following error messages indicate hardware problems:

- BIT Failed (error code 256) – WAN adapter failure
- BIT Failed (error code 512) – EPROM failure.

LEDs

LEDs located on the front and rear panel panels of the IDU and ODU inform users about hardware failures; IDU-to-ODU, Ethernet and air link disruptions. For the detailed description of LEDs and their functions, refer to *Chapter 3*.

Alarms and Traps

Airmux-400 reports compatibility problems, fault conditions of the radio or user links by storing events in the event log and sending traps to the NMS. For the detailed description of the events and instructions on how to use the event log, see *Handling Events* below.

Statistic Counters

The air and service interface performance data is continuously collected during equipment operation. The collected data enables the system administrator to monitor the transmission performance, and thus the quality of service provided to users, for statistical purposes. For detailed description of the statistic counter, see *Monitoring Performance* above.

Link Compatibility Information

Airmux-400 indicates the version compatibility via software traps. As new hardware is added to existing networks compatibility issues may arise. An incompatibility issue is indicated to the user via a change of color of the Link Status box on the Main Menu screen. Trap messages in the Event Log indicate the problems or limitations and suggest upgrades when appropriate.

The following Link Status messages are given:

fullCompatibility - different software versions that are fully compatible. Message indicates that upgrade is available.

restrictedCompatibility - different software versions that operate correctly. However, new features are not supported

softwareUpgradeRequired - different software versions with limited operation. The link will operate as Ethernet only; a full service will not be available. The message is software upgrade required.

versionsIncompatibility - different software versions that are not compatible. User needs to perform local upgrades.

Table 5-3. Link Compatibility Trap Messages

Link State	Link State Text	Link Status Color	Site Description	Site Desc. Color	Link Status Color
fullCompatibility	Active	Green	SW Upgrade Available	Yellow	Green

Link State	Link State Text	Link Status Color	Site Description	Site Desc. Color	Link Status Color
restrictedCompatibility	Active - SW Version mismatch	Magenta (Same as authentication error)	SW Upgrade Recommended	Yellow	Magenta (Same as authentication error)
softwareUpgradeRequired	Active – SW Upgrade Required	Brown (Major)	SW Upgrade Required	Yellow	Brown (Major)
versionsIncompatibility	Not Active - SW Upgrade Required	Red	Local SW Upgrade Required	Yellow	Red

Remote Power Fail Indication

Remote power fail indication indicates to one side that the other side has had a power failure. The failed site sends a final trap indication about the power loss just before powering off.

A Dying-Gasp circuit identifies the power failure at a minimum interval of 20 milliseconds before the IDU crash, during that interval a message notifying the power failure is sent to the remote end.

Alarm output (dry contacts) indicates link loss due to power failure at the remote end.

5.3 Handling Events

Airmux-400 detects compatibility problems, fault conditions of the radio or user links, and initiates alarms to alert the user.

Note

To store the Event Log, first define the IP address, subnet mask, default gateway and trap address of the management PC, see Chapter 4 for details.

Alarms (traps) are displayed in the Event Log in the lower panel of the Main Menu screen. The event log may be saved as a TXT file.

The event log includes the following fields:

- Sequential number (ID)
- Date and time stamp
- Message
- Trap source
- IP address of the ODU that initiated alarm.

Table 5-4. Airmux-400 Alarms and Information Messages

Trap Message	Severity	Remedy
Error loading trap catcher. Port 162 is already in use.	Warning	NMS will not catch any traps from target, some other application has grabbed this port
Device unreachable!	Error	Check connectivity to target
Connected to <site_name>	Information	
<site_name> Site will be reset.	Information	
Restore Factory Default Settings in process on Site <site_name>	Information	
Factory Settings: The process was not finished due to connection issues.	Warning	Check connection to the target ODU and repeat the reset
Reset: The process was not finished due to connection issues.	Warning	Check connection to the target ODU and repeat the reset
Cannot Write to Monitor file. There is not enough space on the disk.	Warning	Free some space on disk and retry
Windows Error: <error_ID>. Cannot Write to Monitor file.	Warning	Operating system error
TDM Counters were cleared for both sides	Information	
Identical IP addresses at <local_site_name> and <remote_site_name>	Warning	Set up a different IP to each site
The Product is not identified at the <local_site_name> site.	Warning	NMS is incompatible with the target release
The Product is not identified at the <remote_site_name> site.	Warning	
The Product is not identified at both sites.	Warning	
Product Not Identified!	Warning	

Trap Message	Severity	Remedy
The Manager identified a newer ODU release at the ‹remote_site_name› site.	Warning	ODU release is newer than NMS release. Wizards are not available. NMS will be used just for monitoring. Upgrade the NMS. (You will get this message as a pop up).
The Manager identified a newer ODU release at both sites.	Warning	
The Manager identified a newer ODU release at the ‹local_site_name› site.	Warning	
Newer Version identified at the ‹local_site_name› site.	Warning	ODU release is newer than NMS release. Wizards are not available. NMS will be used just for monitoring. Upgrade the NMS.
Newer Version identified at the ‹remote_site_name› site.	Warning	
Newer Version Identified!	Warning	

➤ To view summary of saved alarms

- From the Tools menu, choose **Active Alarm**.

  The Active Alarms Summary window opens. See *Table 5-5*; for an explanation of the command buttons.

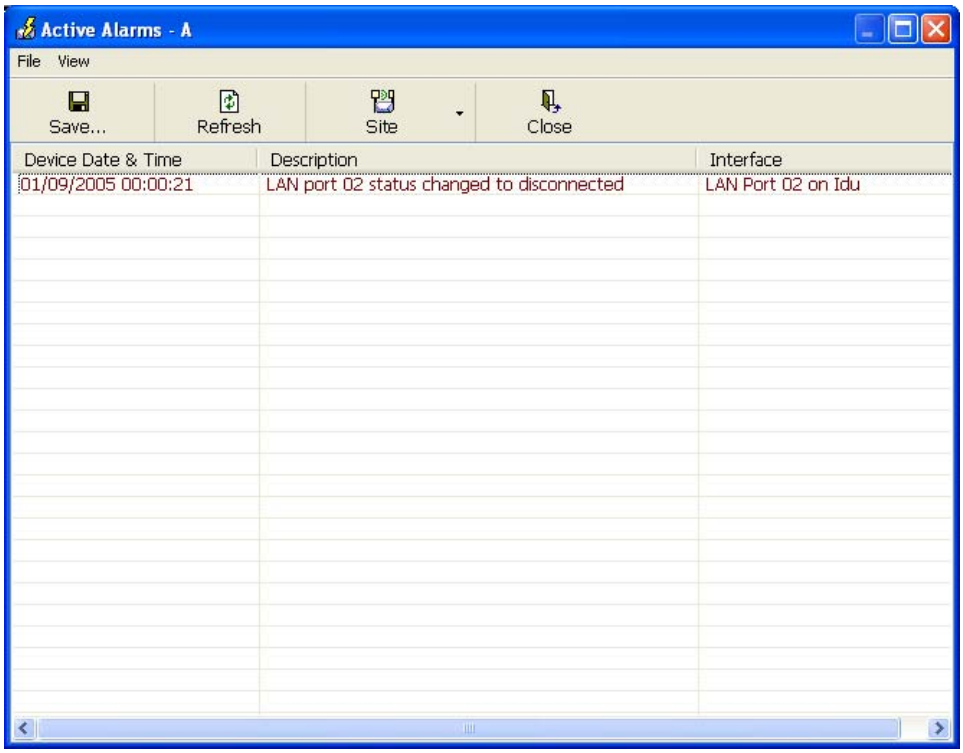


Figure 5-4. Active Alarms Summary

Table 5-5. Active Alarms Command Buttons

Command	Action
Save	Saves the alarms in CSV or text format for further analysis.
Refresh	Reads the alarms from the ODU, and displays the alarms.
Site	Selects site for the active alarms.
Close	Closes the active alarm window.

Setting the Events Preferences

You can define a color that the traps are displayed in the monitor pane, according to severity of the event. The severity is predefined.

➤ **To set the trap color:**

1. From the **Tools** menu, choose **Preferences**.

   The Preferences dialog box appears.

2. Click the **Events** Tab (see *Figure 5-5*).

3. Select the Event priority type and click on the ... button.

   A color chart opens.

4. Select the desired color.
5. Repeat for all the trap types.

➤ **To set the trap background color:**

- Click **Background Color** to change the text background.

➤ **To reset the trap colors:**

- Click **Reset Settings** to return to the default color settings.

Saving the Events Log

➤ **To save the event log:**

1. From the **Tools** menu, choose **Preferences**.

   The Preferences dialog box appears (see *Figure 5-5*).

2. Click the **Events** Tab.
3. Select the file to save.
4. Click the check box to open the file for saving.
5. Click the ... button and in the Select File dialog box indicate in which folder and under what name the alarm log file is to be saved, and click **OK**.

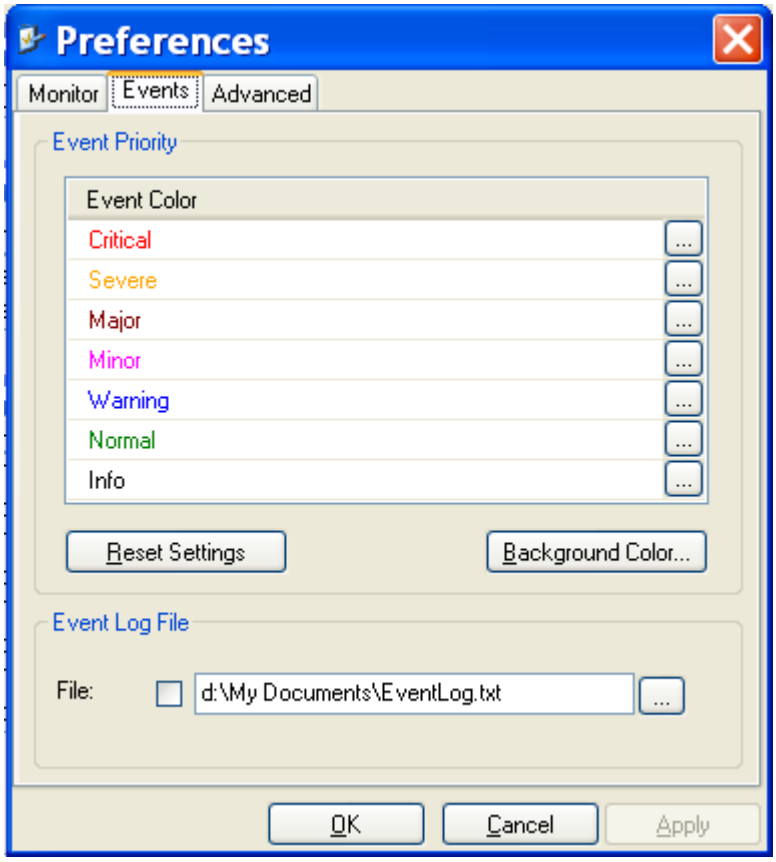


Figure 5-5. Preferences Dialog Box, Event Log Tab

Resetting the Monitoring and Alarm Preferences to Defaults

You can restore all Monitor and Events settings to their original value by using the Advanced Preferences feature.

➤ **To reset the monitoring and alarm preferences to defaults:**

1. From the Tools menu, choose **Preferences**.

   The Preferences dialog box appears.

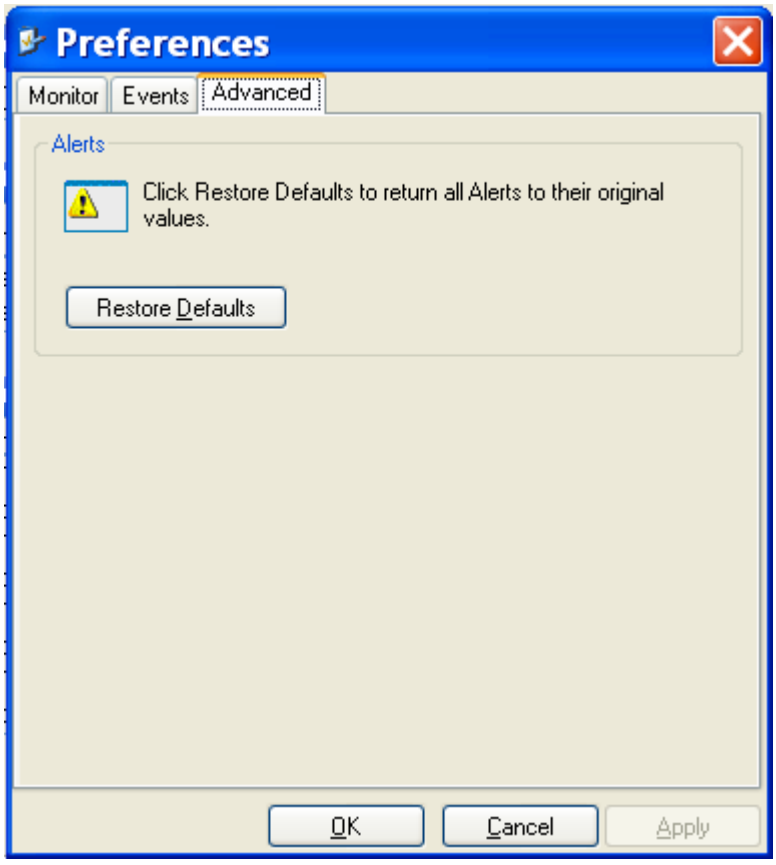


Figure 5-6. Preferences Dialog Box, Advanced Tab

2. Click the **Advanced** tab (see *Figure 5-6*).
3. Click the **Restore Defaults** button.
4. Confirm the operation by selecting **Yes** or **No**.

5.4 Collecting Unified Performance Information

The Get Diagnostic Information feature collects all the link and manager information which can be used for diagnostics.

In the event of needing to contact technical support send this file so as to speed up the assistance.

➤ **To get diagnostic information**

1. Click **Help** on the menu bar, select D**iagnostic Information**.

   The Get Link Information dialog box appears. See *Figure 5-7*.
2. Select or deselect the data options. If the file is to be sent to Technical Support leave all options checked.
3. Click **File Path** to get to the directory to save the file in.
4. Click **Start** to save the information.

The file is saved as **Diagnostic Information.txt**

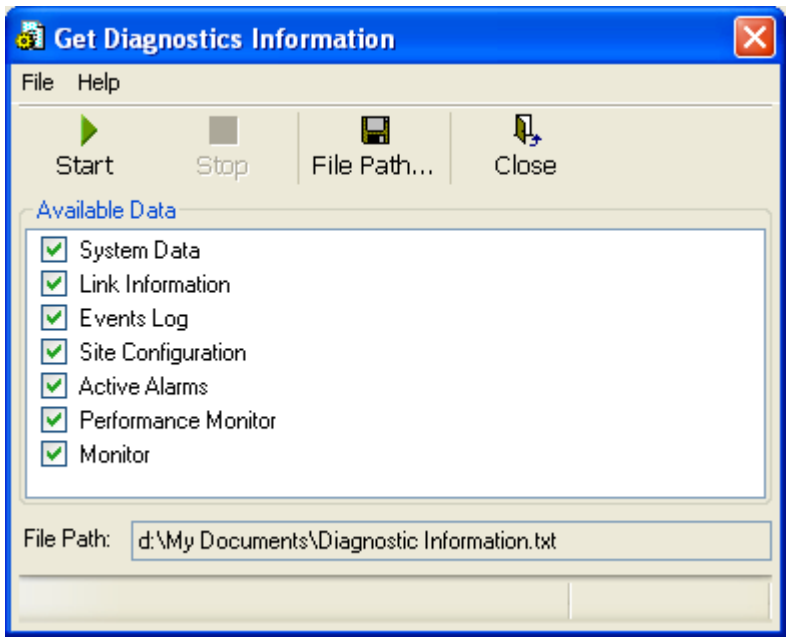


Figure 5-7. Get Diagnostic Information

5.5 Troubleshooting

Use *Table 5-7* and *Table 5-7* to diagnose any faults in the system.

Table 5-6. Troubleshooting

Symptom	Remedy
No power	Verify that AC power is connected to the IDU.
	Verify that the ODU cable is properly wired and connected.
No signal	Complete the installation procedure from the management software.
	Verify the antenna alignment. Check that the radio configuration of both sites is the same (channel and SSID).
Weak signal	Verify the antenna alignment, reconfigure the link.
	Verify the beeper sounds the Best Signal sequence.

The Airmux-400 LEDs show faults in the system or the link.

Table 5-7. Troubleshooting with Airmux-400 LEDs

LED	Status	Remedy
PWR	Off	Check that AC adapter is connected to the IDU-E and the AC power outlet.

LED	Status	Remedy
IDU	Orange	Check that the IDU/ODU cable is properly wired and connected.
ODU	Red	Check that the IDU/ODU cable is properly wired and connected.
AIR I/F	Orange	Complete the installation procedure from the management software.
	Red	Check the ODU Antenna alignment. Check that the radio configuration of both sites is the same (channel and SSID).
SERVICE	Off	Check the service configuration in the NMS.
	Orange	Check that the system is not in loopback mode. Check the remote site IDU ports, cables, and external equipment.
	Red	Check the local site IDU ports, cables, and external equipment.

5.6 Replacing an ODU

Prior to any action verify that both ODUs have the same software version (**Configuration › Configure site › Inventory**). If one ODU has an old software version, perform a software upgrade. It is important to configure the new ODU exactly the same as the old ODU to avoid configuration mismatches, which will disrupt the link.

An ODU may be replaced with a new ODU in one several ways.

- Use the backup
  If a backup of the configuration is available, restore that configuration using Configuration › Configure site › Restore.
- Manual Configuration
  The new ODU can be configured manually according to the link configuration, remember to use the same settings for SSID, channels, link password, IP addresses, and names.
- Restore Factory Setup
  From version 1.6xx the feature of Restore Factory Setup is available. Using this feature we recommend putting the remaining ODU back to factory setup Configuration›Configure site›Advance option, and then activate the second ODU reconfiguring the link from scratch.

Option number 3 is our recommended option preventing configuration mismatches.

5.7 Frequently Asked Questions

Q: What performance issues will arise due to environmental conditions?

A: Airmux-400 is not sensitive to environmental conditions. However if heavy rain or snowfall is expected ensure the performance by allowing a higher fade margin in the link budget planning calculations.

Q: When using the Airmux-400, what is the potential for interference between our system and other cellular or wireless network devices?

A: The Airmux-400 is a robust system. However since it operates in unlicensed band there maybe some interference. Nevertheless, the fact that we can manually set the frequency gives us the flexibility to find a clear channel. In addition each Airmux-400 link uses unique user configurable SSID code.

Q: What type of security is offered on Airmux-400?

A: Airmux-400 has three levels of security:

1. AES hardware mechanism
2. Each unit uses a unique SSID link-specific code (up to 24 alphanumeric characters)
3. Proprietary protocol protects from eavesdropping from other systems.

Q: Can we use horizontal and vertical polarization on the same frequency to double the number of wireless links?

A: Installing two Airmux-400 systems in the same band with cross polarization provides 20–25 dB separations. Nevertheless, since there are reflections, the cross polarization separation is decreased and spatial separation is recommended.

Q: Could you add the frequency of 5.735 to the manual selection in order to increase the number of 20 MHz channels to six?

A: Currently the system provides fixed channels, with one manual frequency setting. The manual setting provides flexibility of spectrum selection, including 5.735 MHz.

Q: Can we manage Airmux-400 using SNMPc other than the supplied management software that comes with the units?

A: Yes. The Airmux-400 is SNMP-based. Airmux-400 can be managed when using other SNMP software after implementing RAD MIBs.

Q: Can Airmux-400 be managed and configured via Telnet?

A: Yes.

Q: Can I use Airmux-400 with any vendor's external antenna?

A: Yes. RAD supplies the Airmux-400 external ODU with an N-type typical connector. Any vendor's external antenna that can be cascaded to our external unit can be used without problem. Please note that dB losses in the cascading

cable between the external ODU and antenna should be taken into consideration. (In the supplied cascading cable of one meter we have 1 dB loss)

Q: Do we need to add external arrestors on Airmux-400 cables?

A: The Airmux-400 ODU includes arrestors and lightning protection. Therefore there is no need to add additional arrestors.

Q: What is the actual Ethernet data rate and maximum throughput?

A: The maximum net throughput of Airmux-400 is full duplex 18 Mbps.

Note

Airmux-400 is a symmetrical system

Q: What is the sensitivity for each rate of the Airmux-400?

A: The rate sensitivities are:

Rate [Mbps]	Sensitivity [dB]
12	-84
18	-81
36	-74
48	-68

Q: Does Airmux-400 withhold any MAC Addresses?

A: The Airmux-400 is a layer 2 Bridge (VLAN transparent). The built-in switch contains a MAC Address table up to 2047.

Q: Can I use any category 5e cable in order to connect the IDU and ODU?

A: The cable should be suitable for outdoor use, and shielded Category 5e.

Q: What are the BER values expected in the Airmux-400 link?

A: 10-11 (according to BER sensitivity threshold)

Q: Does Airmux-400 use DSSS technique?

A: No, Airmux-400 uses the advanced OFDM technique.

5.8 Technical Support

Technical support for this product can be obtained from the local distributor from whom it was purchased.

For further information, please contact the RAD distributor nearest you or one of RAD's offices worldwide. This information can be found at www.rad.com (offices – About RAD > Worldwide Offices; distributors – Where to Buy > End Users).

Appendix A
Connection Data

A.1 ODU-IDU Cable

The ODU-IDU cable is standard CAT-5, four twisted pair 24 AWG FTP, terminated with RJ-45 connectors on both ends. It is covered by a cable gland on the ODU side for hermetic sealing.

Table A-1 shows the connector pinout.

Table A-1. ODU-IDU Cable Connector Pinout

IDU RJ-45		Wire Color	Function	ODU RJ-45
1	twisted	White/Green	Ethernet (RxN)	1
2	pair	Green	Ethernet (RxT)	2
3	twisted	White/Orange	Ethernet (TxT)	3
6	pair	Orange	Ethernet (TxN)	6
4	twisted	Blue	Power (+)	4
5	pair	White/Blue	Power (+)	5
7	twisted	White/Brown	Power (–)	7
8	pair	Brown	Power (–)	8

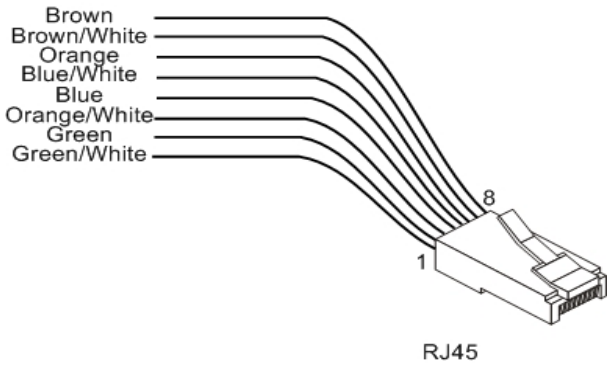


Figure A-1. RJ-45 Wiring for IDU-ODU Cable

A.2 LAN Port

The LAN 10/100BaseT interface terminates in an 8-pin RJ-45 connector, wired in accordance to *Table A-2*.

Table A-2. Fast Ethernet Connector Pinout

Pin	Signal	Function
1	TD (+)	Transmit Data (positive)
2	TD (–)	Transmit Data (negative)
3	RD (+)	Receive Data (positive)
6	RD (–)	Receive Data (negative)

A.3 IDUE Connectors

IDUE DC Power Terminal

Table A-3. Terminal Block 3-pin -48VDC

Pin	Connection
Right	+
Center	Chassis
Left	–

IDUE Alarm Connector

The IDUE Alarm interface is a 25-pin D-type female connector. *Table A-4* lists the alarm connector pinout.

Table A-4. Alarm Connector (Dry Contact)

I/O	Description	Pin
Input 1	Positive	14
Input 1	Negative	15
Input 2	Positive	16
Input 2	Negative	17
Input 3	Positive	18

I/O	Description	Pin
Input 3	Negative	19
Input 4	Positive	20
Input 4	Negative	21
Output 1	Normally Open	1
Output 1	Common	2
Output 1	Normally Closed	3
Output 2	Normally Open	4
Output 2	Common	5
Output 2	Normally Closed	6
Output 3	Normally Open	7
Output 3	Common	8
Output 3	Normally Closed	9
Output 4	Normally Open	10
Output 4	Common	11
Output 4	Normally Closed	12

The following diagram describes how to connect external input and output alarms.

Note

- *Use an external current limit resistor to limit the current at the output relays to 1 Ampere. Such resistor is not required if the equipment connected to the IDU supports current limiting to 1 Amp.*
- *The voltage of the input alarm must be within the range of -10 to -50 VDC.*

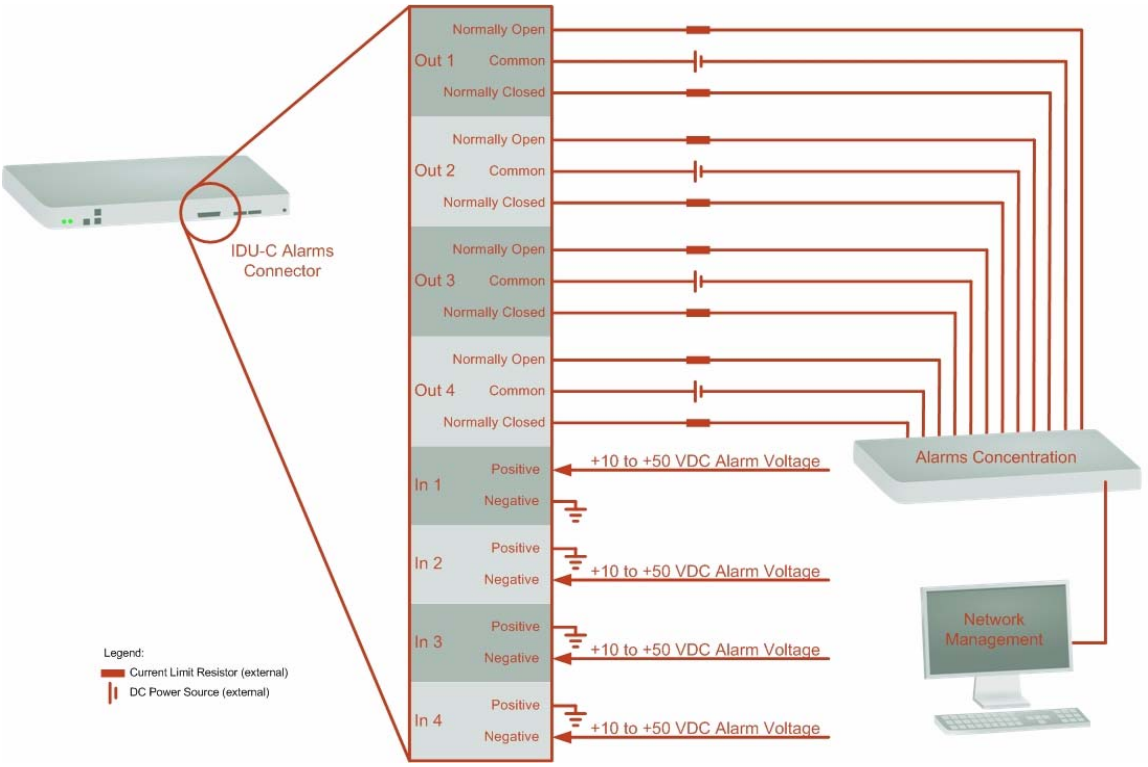


Figure A-2. Connecting External Alarm Equipment

Input Alarms

The input alarms are raised by events from external equipment, such as a fire warning, door open or air conditioner failure.

Output Alarms

Output alarms are generated through dry contact relays to indicate various system events according to the following table. An alarm is raised if at least one of the conditions is met.

Table A-5. Output Alarm Pinout

Alarm	Description	Alarm On Conditions	Alarm Off Condition
Output 1	Air interface alarm	Link is down Link in installation mode Link authentication problem	Link is up
Output 2	Equipment alarm	Built in Test (BIT) error No connection to the ODU Incompatible software	Both ODU and IDU are in operational state
Output 3	Service alarm at site B	N/A	Permanently off

Alarm	Description	Alarm On Conditions	Alarm Off Condition
Output 4	Power failure at site B	Link Loss due to power failure at Site B	Link is up or down without power failure indication within the last two seconds

Appendix B

Mast and Wall Installation

B.1 Mounting the ODU or O-PoE

The ODU or O-PoE can be mounted on a mast or a wall.

ODU Mounting Kit Contents

The ODU mounting kit includes the following items:

- One large clamp (*Figure B-1*)
- One small clamp (*Figure B-2*)
- One arm (see *Figure B-3*)
- Four screw hex head M8x40
- Two screw hex head M8x70
- Four washer flat M8
- Three washer spring M8
- Two M8 nuts.

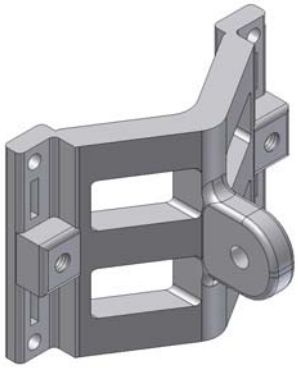


Figure B-1. Large Clamp

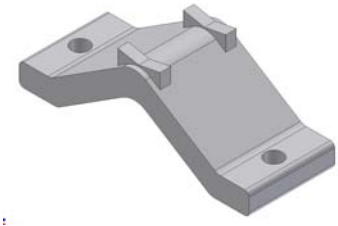
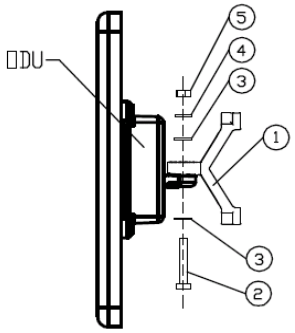


Figure B-2. Small Clamp

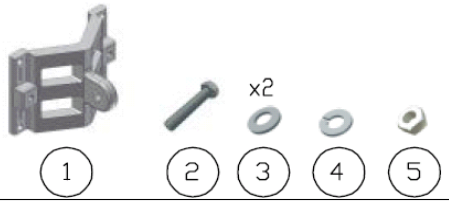
Figure B-3. Arm

Mounting Airmux-400 on a Mast



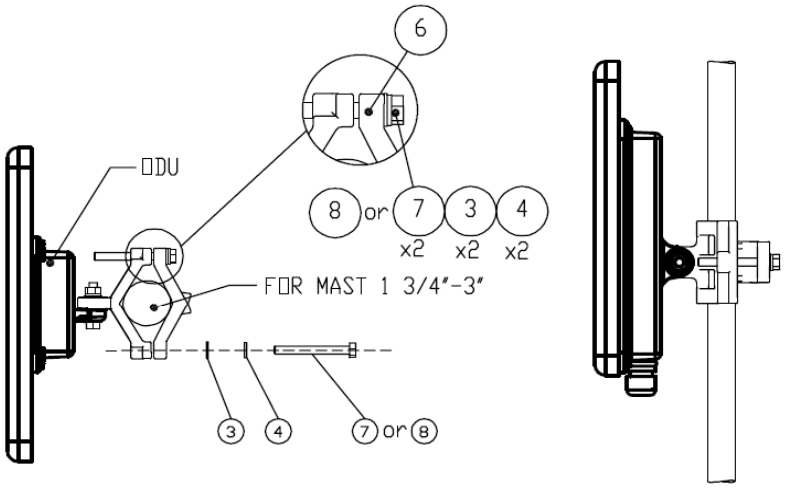
Installation Kit

ITEM	DESCRIPTION	QTY
1	Clamp	1
2	Screw hex head M8x40	1
3	Washer flat M8	4
4	Washer spring M8	3
5	Nut M8	1
6	Clamp	1
7	Screw hex head M8x40 (for 1 3/4" dia mast)	2
8	Screw hex head M8x70 (for greater size of mast)	2



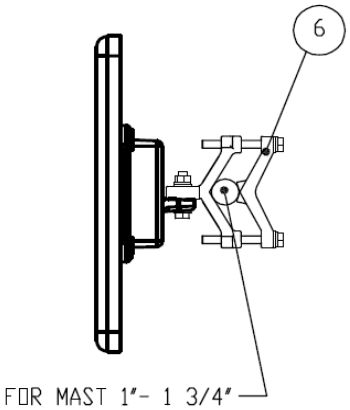
STEP 1

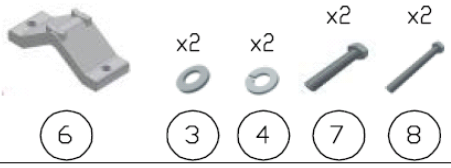
Attach item 1 to the base (mate knurled surfaces) using items 2 ,3 ,4 ,5 as shown Use tightening torque of 24 N/m.



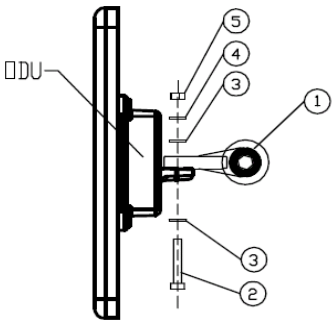
STEP 2

Tighten the antenna to the mast , using item 6, screws, and washers items 7 ,3 ,4 as shown. Use tightening torque of 14 N/m.



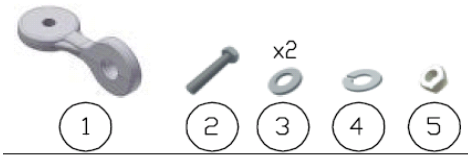


Mounting Airmux-400 on a Wall

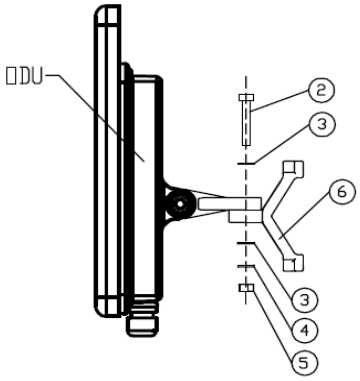


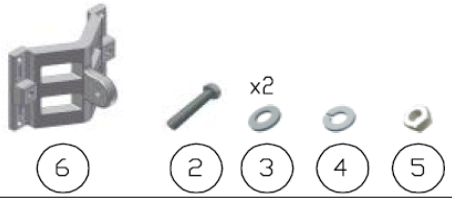
Installation Kit

ITEM	DESCRIPTION	QTY
1	Arm	1
2	Screw hex head M8x40	2
3	Washer flat M8	4
4	Washer spring M8	2
5	Nut M8	2
6	Base wall	1



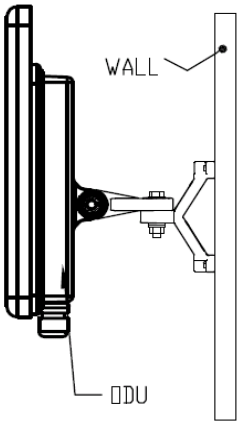
STEP 1
Attach item 1 to the base
(mate knurled surfaces)
using items 2, 3, 4, 5 as shown.
Use tightening torque of 24 N/m.





STEP 2
Attach item 6 to the arm
(mate knurled surfaces)
using items 2 ,3 ,4 ,5 as shown.
Use tightening torque of 24 N/m.

STEP 3
Install ant. to wall
(hardware supplied by customer)



B.2 Mounting an External Antenna

The optional external antenna can be mounted on a mast.

External Antenna Mounting Kit Contents

The external antenna mounting kit includes the following items:

- Twelve flat washers
- Eight spring washers
- Eight hex nuts
- Four bolts
- One U-bracket
- One pivoting bracket
- Two metal strap clamps.

➤ To install external antenna on the mast:

1. Attach the U-bracket to the back of the antenna using four flat washers, four spring washers and four hex nuts.
2. Attach the pivoting bracket to the U-bracket using eight flat washers, four spring washers, four hex nuts and four bolts.
3. Pass both strap clamps through the vertical slots in the pivoting bracket.
4. Attach the antenna to the mast using the two strap clamps.
5. Adjust the required tilt using the angular scale and tighten all bolts and nuts at the required position.

Appendix C

Link Budget Calculator

The Link Budget Calculator is a utility for calculating the expected performance of the Airmux-400 wireless link and the possible configurations for a specific link range.

The utility allows you to calculate the expected RSS of the link, and find the type of services and their effective throughput as a function of the link range and deployment conditions.

C.1 Initiating the Link Budget Calculator

The Link Budget Calculator is supplied on the Airmux Manager CD. It may be run directly from the CD or from the Airmux Manager application.

➤ **To run the Link Budget Calculator directly from the CD:**

1. Insert the Airmux Manager CD into the drive on the managing computer. In the window which opens, click the Link Budget Calculator option.
2. If the CD autorun application does not start by itself, then point your browser to: Z:\RAD\Setup\DATA\Link Budget Calculator.htm

   where Z must be replaced with your own CD drive name.

➤ **To run the Link Budget Calculator from the Airmux Manager:**

- Choose Help › Link Budget Calculator from the main menu of the Airmux Manager.

  The Link Budget Calculator window is displayed (*Figure C-1*).

Note *Allow running scripts when activating the Link Budget Calculator in Internet Explorer.*

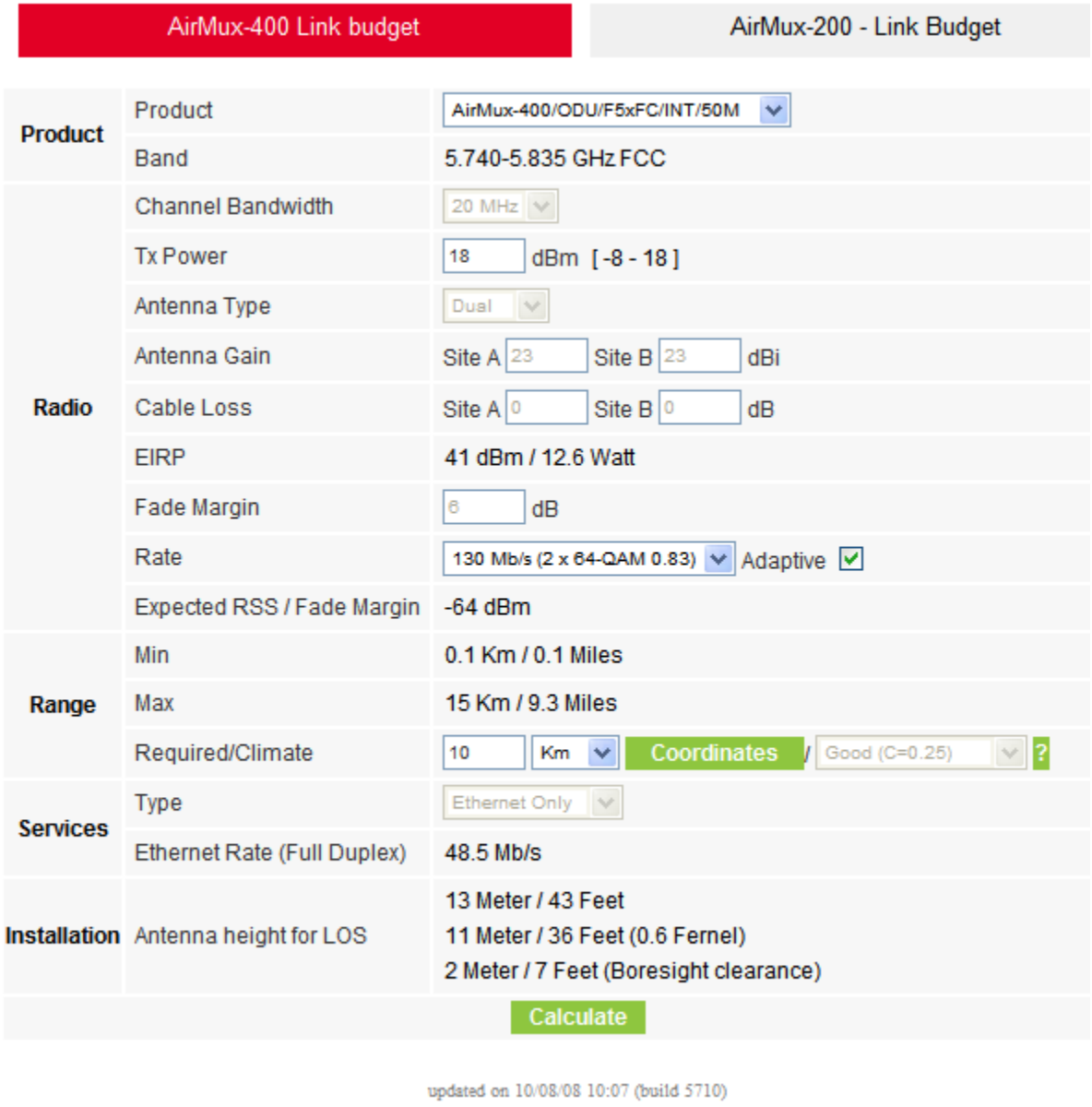


Figure C-1. Link Budget Calculator

Link Budget Calculator Parameters

You are required to enter or choose the following parameters. Depending on the product, some of the parameters have a default value that cannot be changed.

- Product (or regulation and band)
- Channel bandwidth (fixed to 20 MHz)
- Tx power (maximum Tx power per modulation is validated)
- Antenna type (cannot be changed for ODU with integrated antenna)
- Antenna gain per site (cannot be changed for integrated antenna)
- Cable loss per site (cannot be changed for integrated antenna)

- Required fade margin
- Rate (and adaptive check box)
- Service type (Ethernet Only for AirMux-400 version 2.1)
- Required range.

For each product (or regulation and band) the calculator stores the following data required for link budget calculations:

- Maximum transmit power (per modulation)
- Receiver sensitivity (per modulation) for Ethernet service and for TDM services at various BER
- Maximum linear input power (used to calculate minimum distance)
- Antenna gain and cable loss for ODU with integrated antenna
- Available channel bandwidths.

Calculations

EIRP

$$EIRP = TxPower + AntennaGain_{SiteA} - CableLoss_{SiteA}$$

Expected RSS and Fade Margin

$$ExpectedRSS = EIRP - PathLoss + AntennaGain_{SiteB} - CableLoss_{SiteB}$$

where:

- Site A is the transmitting site
- Site B is the receiving site
- PathLoss is calculated according to the free space model,

$$PathLoss = 32.45 + 20 \times \log_{10}(frequency_{MHz}) + 20 \times \log_{10}(RequiredRange_{Km})$$

$$ExpectedFadeMargin = Sensitivity - ExpectedRSS$$

where Sensitivity is dependent on air-rate.

Min and Max Range

MinRange is the shortest range for which $ExpectedRSS \le MaxInputPower$ per air-rate.

MaxRange (with Adaptive checked) is the largest range for which $ExpectedRSS \ge Sensitivity$, at the highest air-rate for which this relationship is true. In a link with adaptive rate this will be the actual behavior.

MaxRange (for a given air-rate) is the largest range for which $ExpectedRSS \ge Sensitivity + RequiredFadeMargin$.

Service

The Ethernet throughput is calculated according to internal product algorithms.

Availability

The Service Availability calculation is based on the Vigants Barnett method which predicts the downtime probability based on a climate factor (C factor).

$$Availability = 6 \times 10^{-7} \times Cfactor \times frequency_{GHz} \times (RequiredRange_{KM})^3 \times 10^{\frac{-ExpectedFadeMargin}{10}}$$

Antenna Height

The recommended antenna height required for line of sight is calculated as the sum the Fresnel zone height and the boresight height. See *About the Fresnel Zone* below.

The Fresnel zone height is calculated as: $\sqrt{\frac{2 \times \frac{300}{frequency_{GHz}} \times \left[\frac{ExpectedRange}{2}\right]^2}{\frac{ExpectedRange}{2} + \frac{ExpectedRange}{2}}}$

The boresight clearance height is calculated as: $\sqrt{R^2_{Maean} + \left[\frac{ExpectedRange}{2}\right]^2} - R_{Maean}$

where $R_{Mean} = 6367.4425Km$.

C.2 Using the Link Budget Calculator

➤ **To use the Link Budget Calculator for Airmux-400:**

1. Choose a product from the drop-down list (or choose a Regulation and Band):

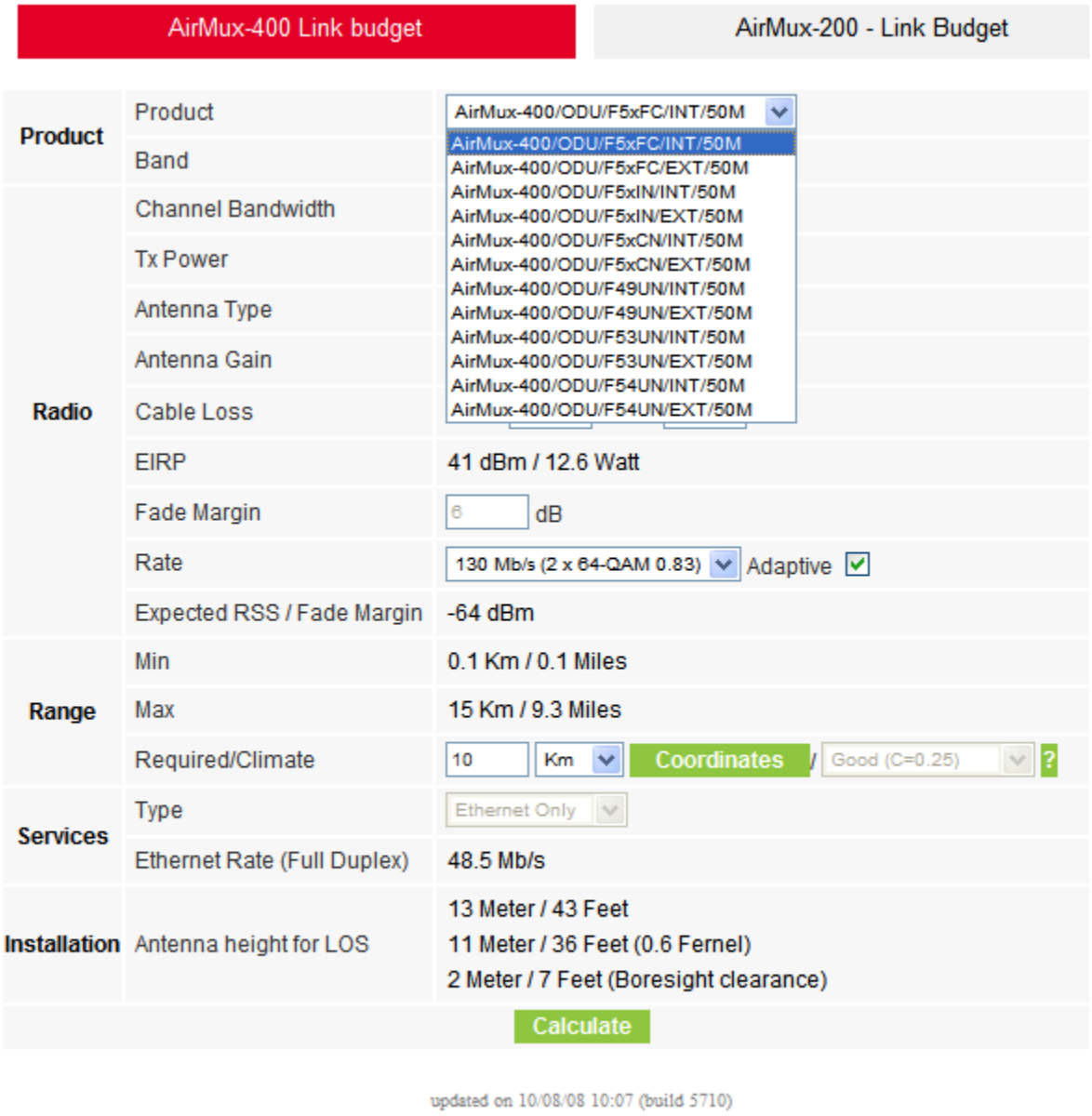


Figure C-2. Selecting a Product

2. Enter the radio details.

Note *Rate is chosen from a drop-down list.*

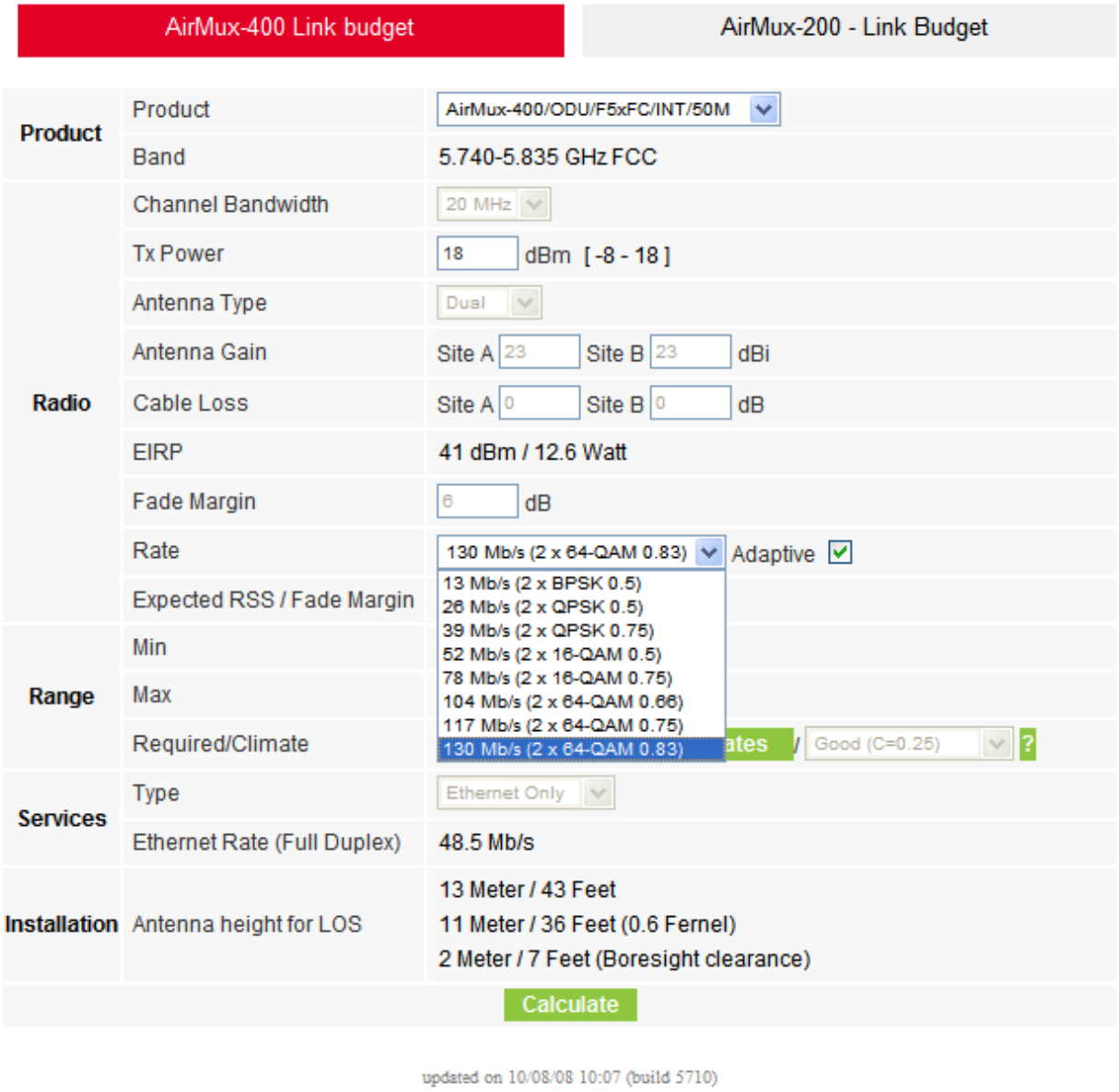


Figure C-3. Selecting the Rate

The **Rate** shown, defines the air-interface rate in Mbps. The system operates in TDD mode and has the overhead of the air-interface protocol Thus, the actual Ethernet throughput is provided by the **Ethernet Rate**.

Note *For a given air rate, Ethernet throughput decreases with increasing range due to propagation delay.*

The Fade margin is the minimum required for LOS conditions. For degraded link conditions, a larger Fade margin should be used.

The EIRP is given in dBm and Watts.

3. If the required range between the two link sites is known, you may enter it directly. Alternatively, you may enter the latitude and longitude of each site in the link, in which case the distance between them will be calculated and displayed.

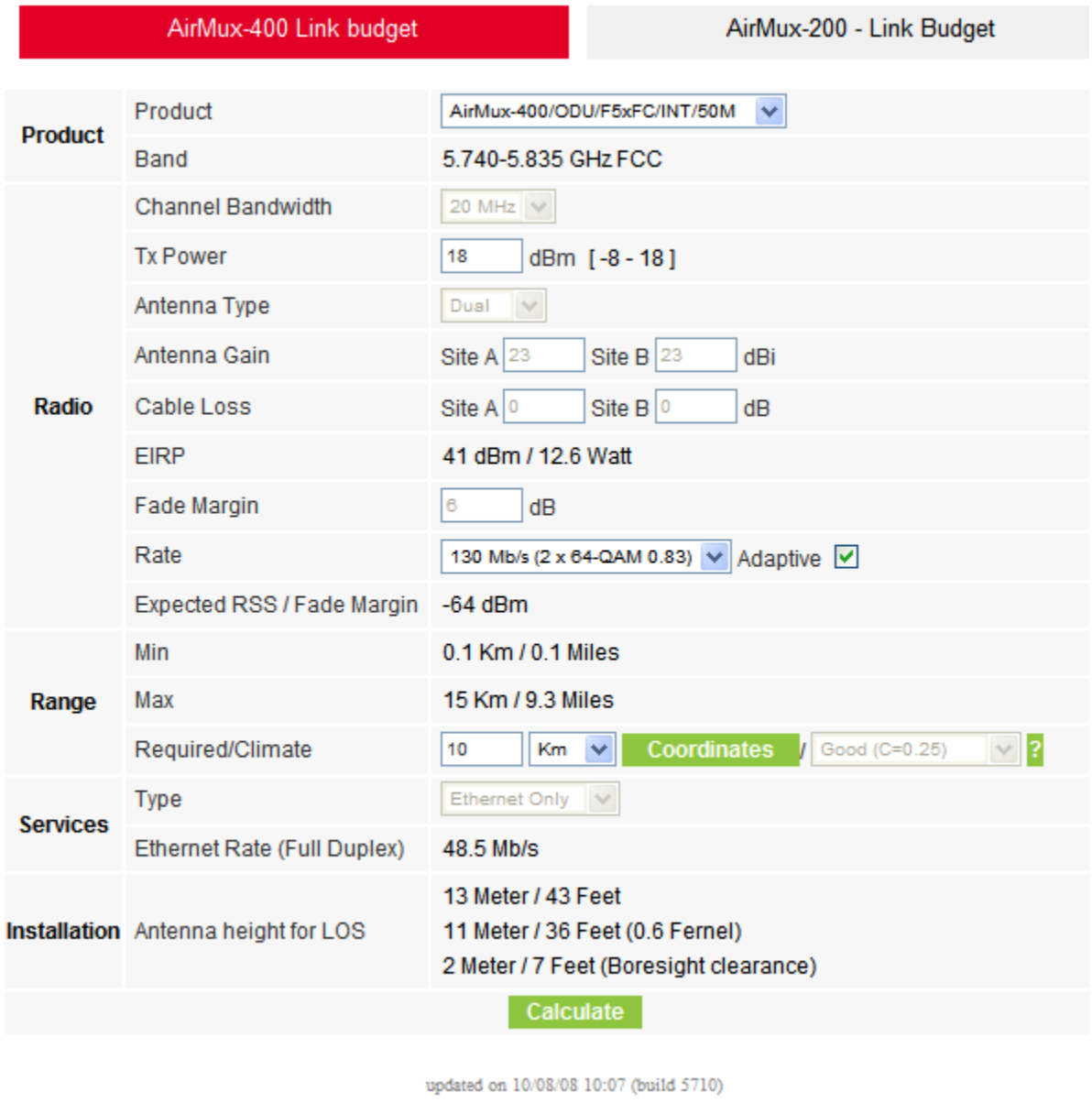


Figure C-4. Calculating Distance from Site Coordinates

4. Located to the right of the green Coordinates button is a dropdown list of Climactic C Factor values.

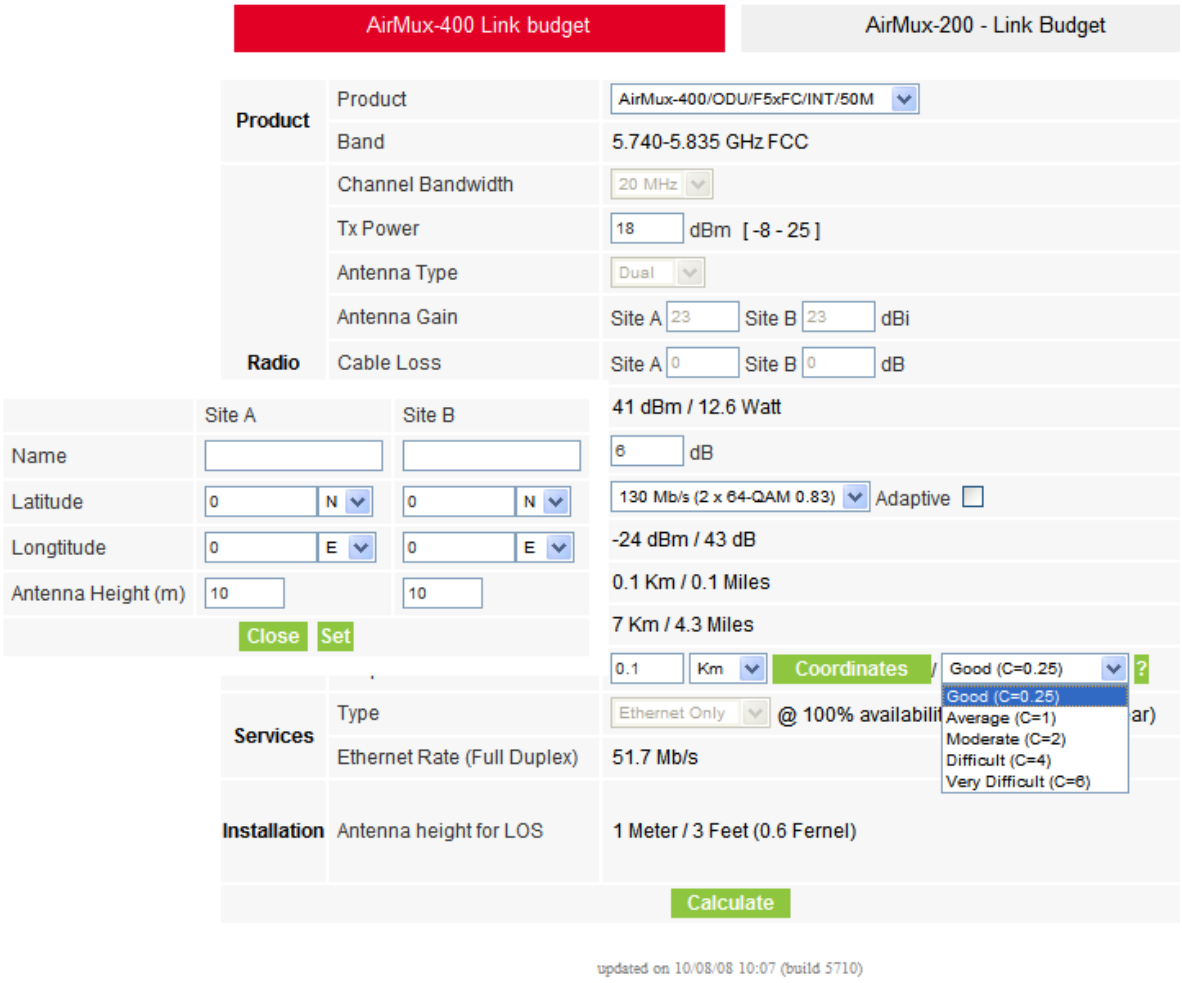


Figure C-5. Selecting Climate Factor

5. For climate factors descriptions, click **?** to the right of the drop-down list.

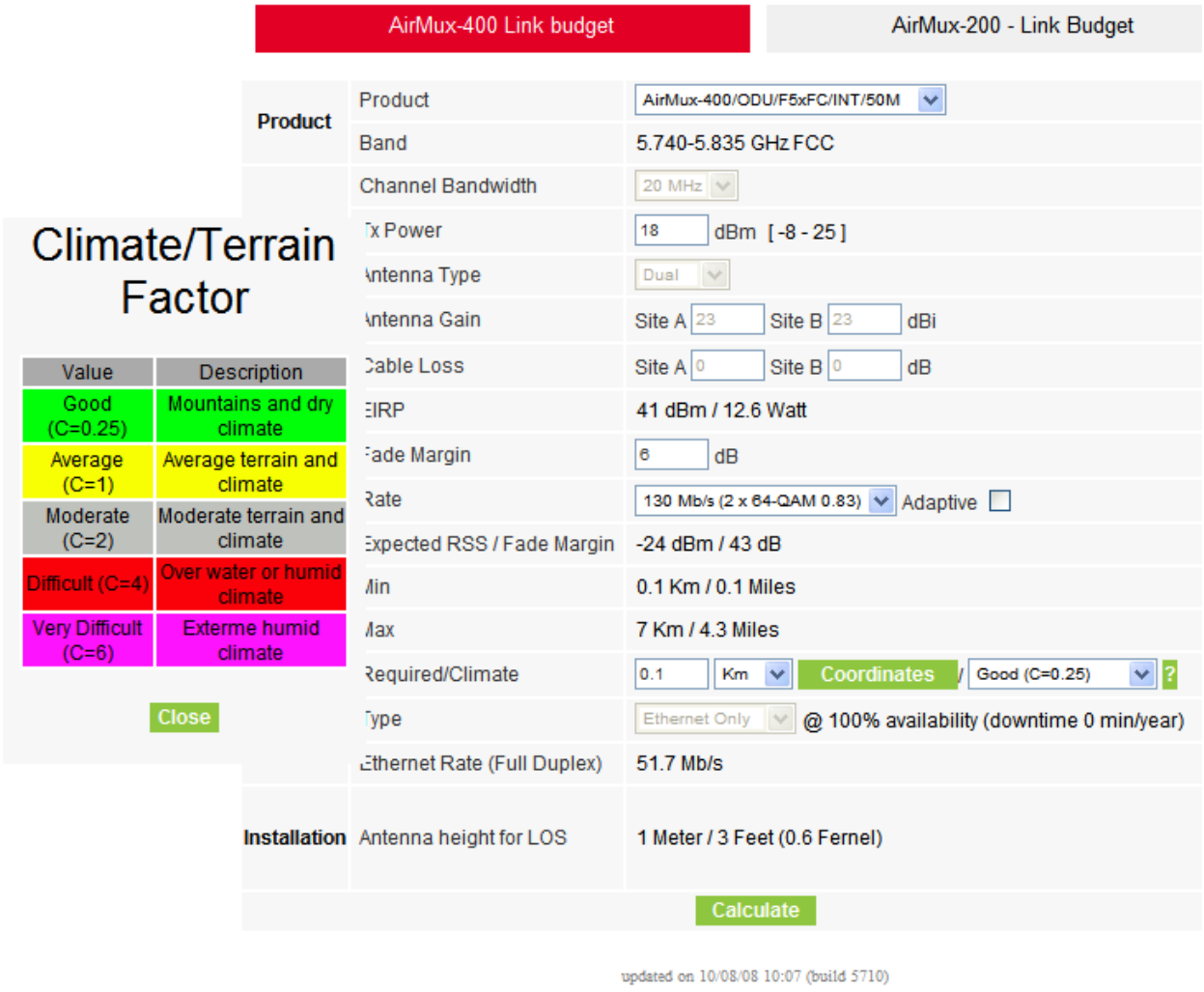


Figure C-6. Climate Factors Description

Figure C-7 displays world map with the climate factor contours.

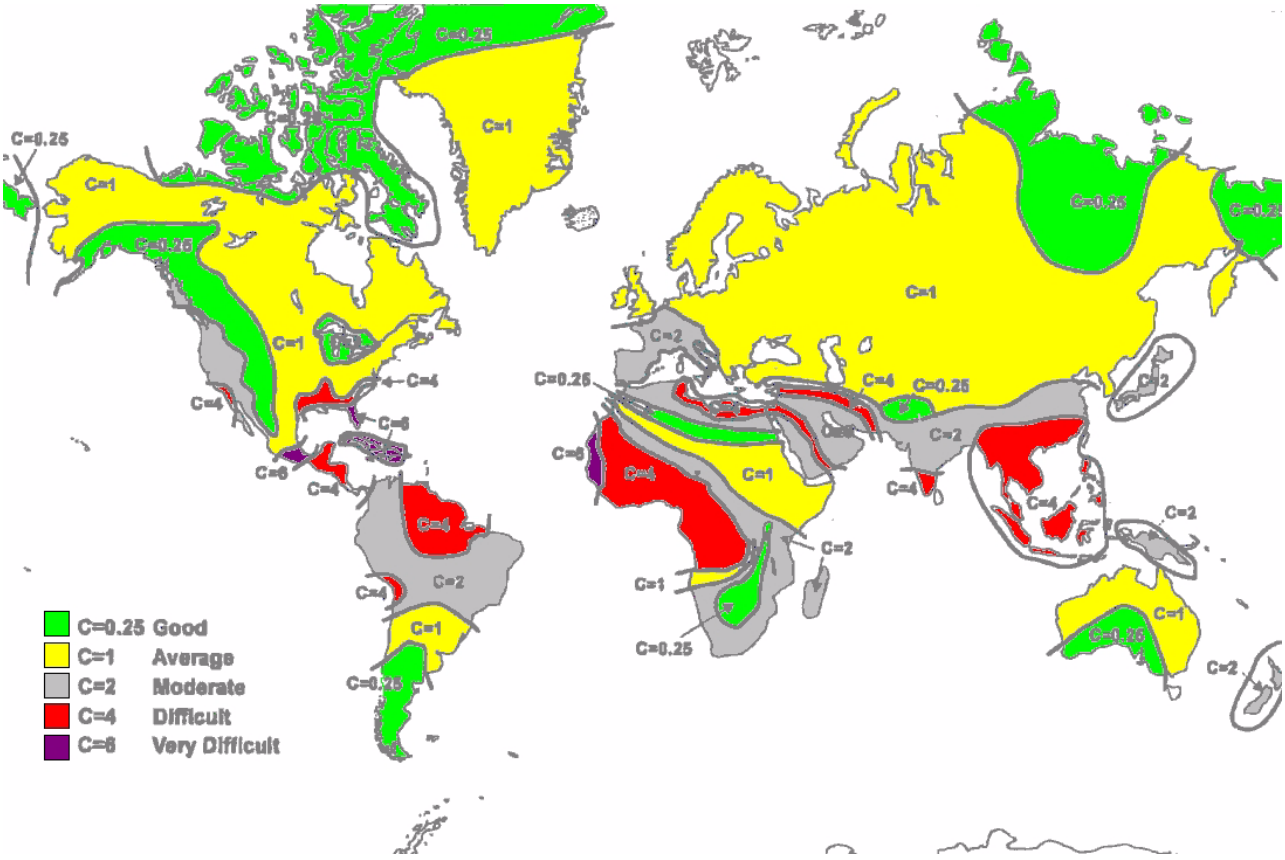


Figure C-7. World Map with Climate Factor Contours

6. Click **Calculate** to obtain the required performance estimate.

Note *Placing the cursor in any other calculated field also updates the calculated results.*

The Expected Performance parameters are calculated and displayed:

- **Expected RSS** – the expected RSS that the Airmux Manager shows when the Airmux-400 ODUs are optimally aligned
- **Ethernet Rate** – maximum throughput available for the chosen parameter combination
- **Antenna height for LOS** – the minimum antenna height required for line-of-sight operation. It is the sum of the height required for boresight clearance due to the earth's curvature plus the height required to clear the Fresnel zone.

If the expected performance is not suitable for your application, try different parameters and repeat the calculation.

C.3 About the Fresnel Zone

The Fresnel zone is an elliptically shaped conical zone of electromagnetic energy that propagates from the transmitting antenna to the receiving antenna. It is always widest in the middle of the path between the two antennas.

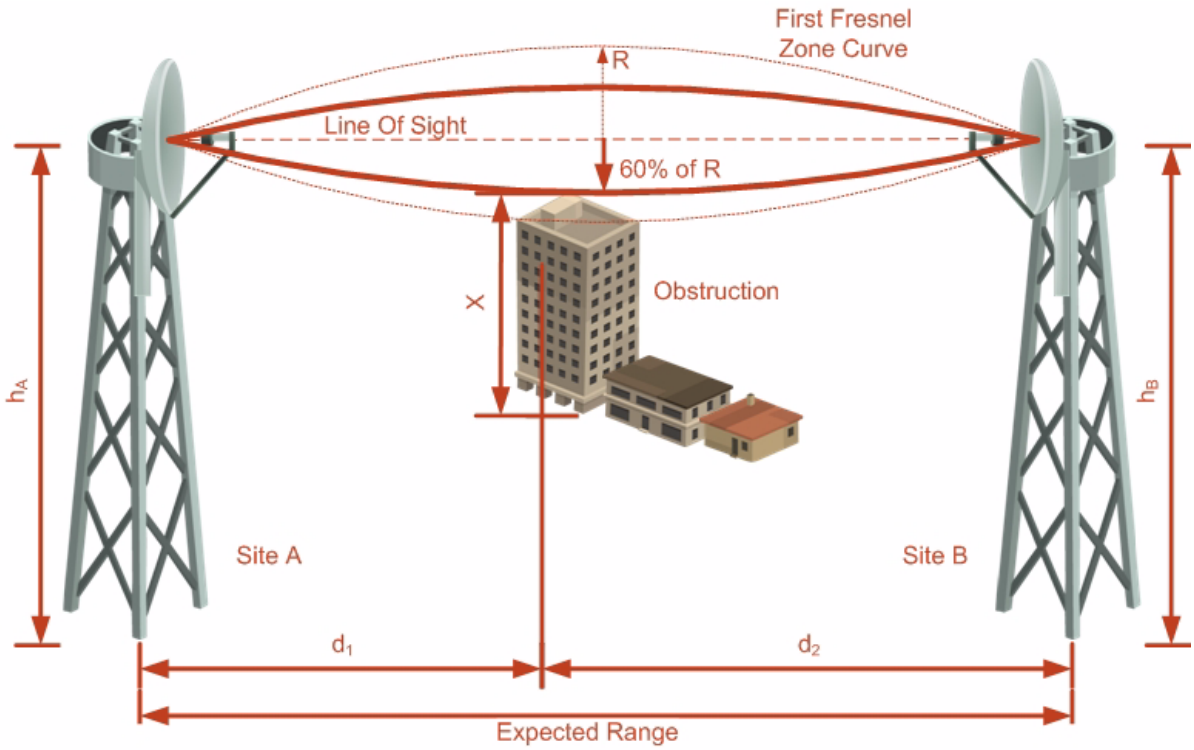


Figure C-8. Fresnel Zone

Fresnel loss is the path loss occurring from multi-path reflections from reflective surfaces such as water, and intervening obstacles such as buildings or mountain peaks within the Fresnel zone.

Radio links should be designed to accommodate obstructions and atmospheric conditions, weather conditions, large bodies of water, and other reflectors and absorbers of electromagnetic energy.

The Fresnel zone provides us with a way to calculate the amount of clearance that a wireless wave needs from an obstacle to ensure that the obstacle does not attenuate the signal.

There are infinitely many Fresnel zones located coaxially around the center of the direct wave. The outer boundary of the first Fresnel zone is defined as the combined path length of all paths, which are half wavelength (1/2 λ) of the frequency transmitted longer than the direct path. If the total path distance is one wavelength (1 λ) longer than the direct path, then the outer boundary is said to be two Fresnel zones. Odd number Fresnel zones reinforce the direct wave path signal; even number Fresnel zones cancel the direct wave path signal.

The amount of the Fresnel zone clearance is determined by the wavelength of the signal, the path length, and the distance to the obstacle. For reliability, point-to-point links are designed to have at least 60% of the first Fresnel zone clear to avoid significant attenuation.

The concept of the Fresnel zone is shown in *Figure C-8* above. The top of the obstruction does not extend far into the Fresnel zone, leaving 60% of the Fresnel zone clear; therefore, the signal is not significantly attenuated.

Appendix D

Lightning Protection and Grounding Guidelines

This appendix describes how to achieve best protection against electric shock and lightning.

Warning

100% protection is neither implied nor possible.

Note *This appendix is at best a guide. The actual degree of lightning protection required depends on local conditions and regulations.*

D.1 Protection Elements

Lightning protection system consists of the following components:

- Grounding for the antenna coax cable
- Grounding for each IDU and ODU
- External primary surge suppressor units and grounding for the outdoor cable
- Internal ESD protection circuits over the power/telecom lines.

D.2 Grounding for Antenna Cable

A grounding kit must be connected to the coax antenna cable and reliably grounded as shown in *Figure D-1*. The grounding kit is an Andrew Type 223158-2 (www.andrew.com).

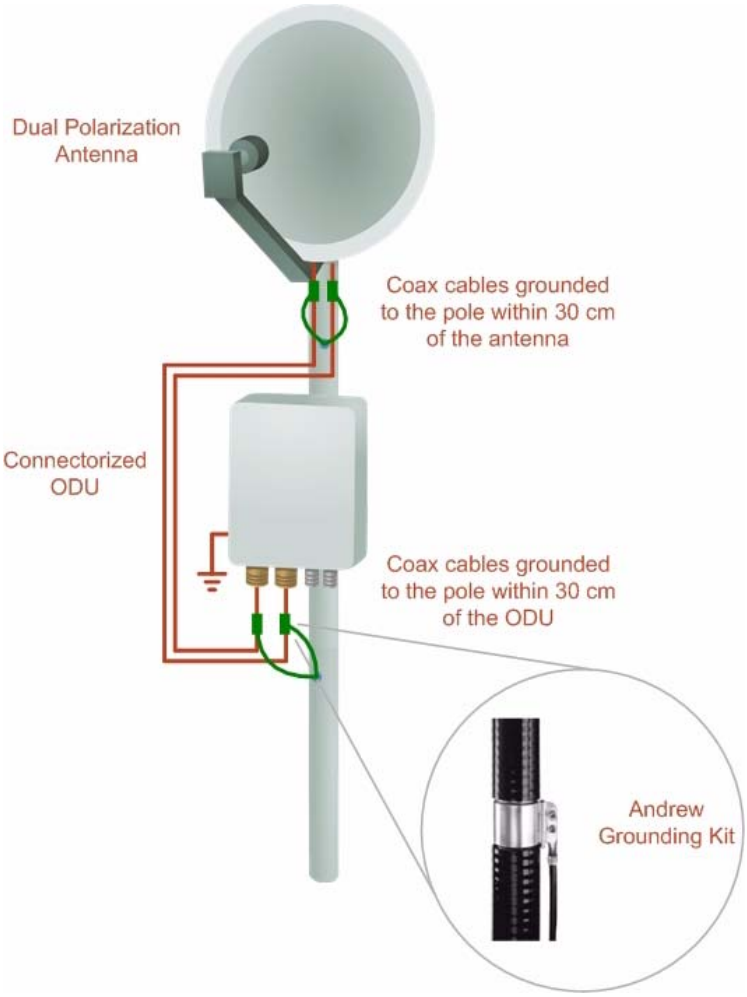

Dual Polarization Antenna
Coax cables grounded to the pole within 30 cm of the antenna
Connectorized ODU
Coax cables grounded to the pole within 30 cm of the ODU
Andrew Grounding Kit

Figure D-1. Grounding Antenna Cables

D.3 Grounding for Outdoor/Indoor Units

ODU and IDU of the Airmux-400 system must be grounded.

ODU Grounding

Airmux-400uses a shielded CAT-5e cable to interconnect the outdoor (ODU) and indoor (IDU) units. However, this shielding does not provide a good lightning discharge path, since it cannot tolerate the high lightning current surges.

To provide an alternate lightning discharge path, the ODU and antenna grounding posts should be connected to ground point by a 10 AWG short copper wire. The device must be permanently connected to ground.

IDU Grounding

The IDUs grounding post should be connected to the internal ground point, using a grounding wire of at least 10 AWG. The grounding wire should be connected to a grounding rod or the building grounding system. The device must be permanently connected to ground.

D.4 External Lightning Surge Suppressors and Grounding

A grounding kit and surge arrestor unit must be located near the ODU and properly grounded as illustrated below.

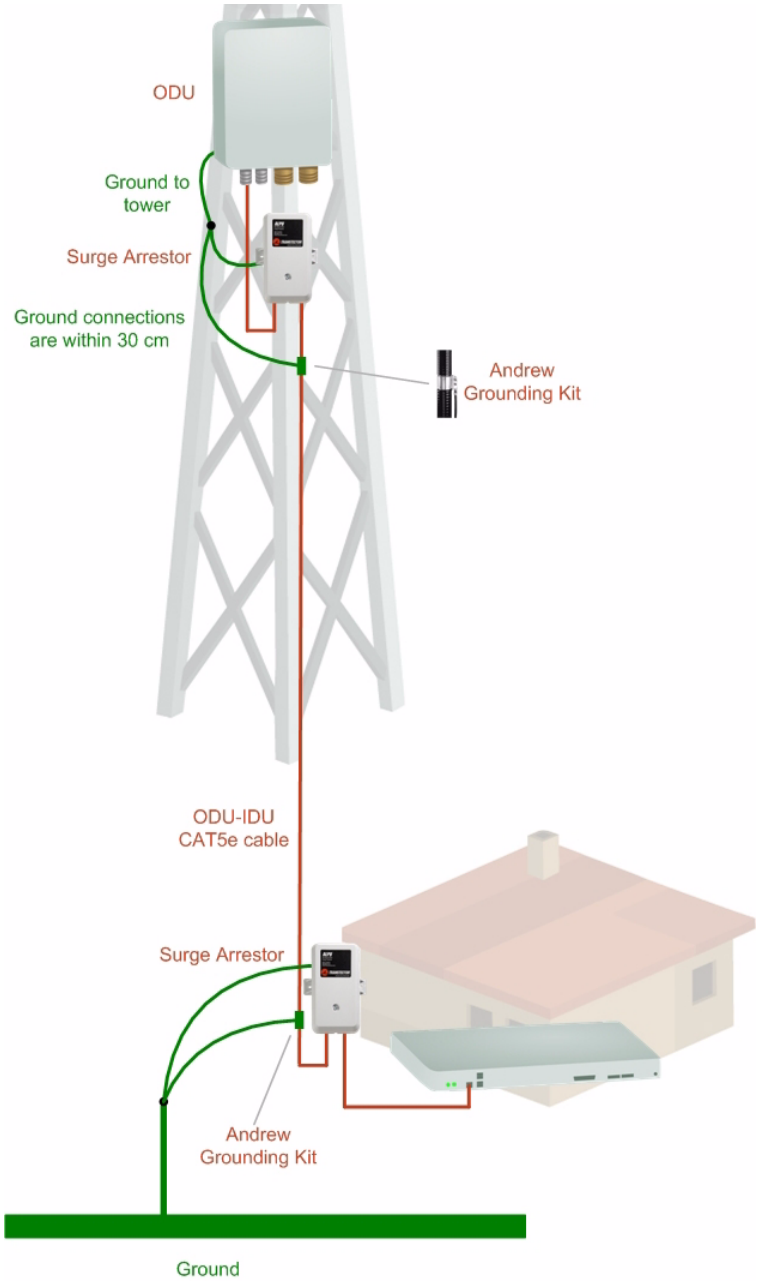


Figure D-2. Grounding a Typical Pole Installation

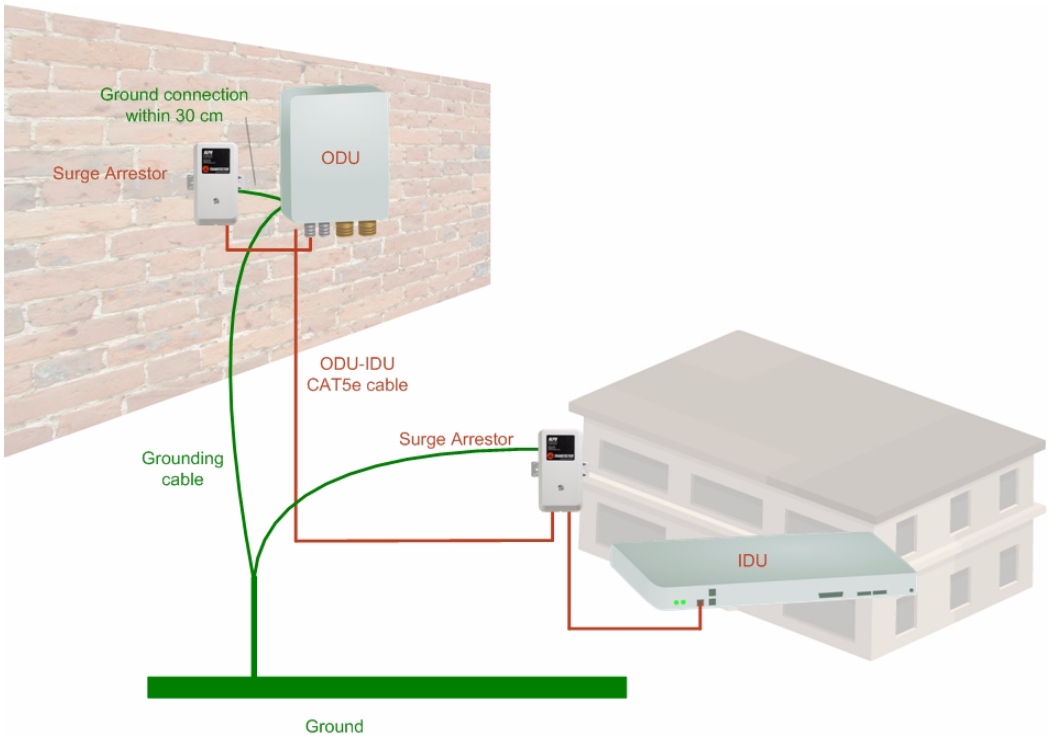


Figure D-3. Grounding a Typical Wall Installation

The next figure illustrates a close-up of the rear of grounded ODU:

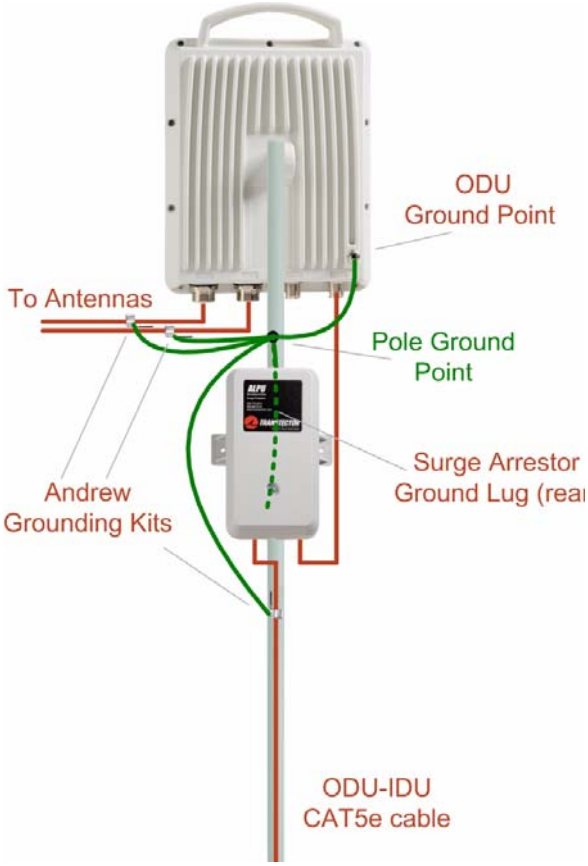


Figure D-4. ODU Surge Suppressor and Grounding

The Transtector protection circuits shown in *Figure D-5* below, utilize silicon avalanche diode technology. The unit consists of an outdoor-rated NEMA 3R type enclosure with easy mounting flanges, ground stud attachment and easy wiring.

The ALPU-POE features RJ-45 protection circuits for the ODU-IDU data pairs (pins 1, 2 and 3, 6) and DC power (pins 4, 5 and 6, 7 with the pairs bonded).

The unit is designed to be wall-mounted. An optional set of bracket is available to allow a wide range of pole mount applications. A dedicated ground stud is provided inside the unit that must be bonded to the nearest grounding system (or master ground bar) for proper surge protection.

The system wiring is installed with RJ-45 type connectors that can feed directly into the chassis without having to cut, splice or route through awkward strain relief holes.

Figure D-5. Surge Suppressor

➤ **To mount the lightning protection devices:**

1. Mount the device as close to the ODU as possible. Mount the unit so that the cable connectors are at the bottom (to prevent water from penetrating), with the strain reliefs facing the ground.
2. Remove the cover by unscrewing the front of the unit.
3. Mount the unit to an outside surface using the two mounting holes.
4. Connect the ODU-IDU cable using the RJ-45 jack.
5. Connect one cable between the ODU and the suppressor using an RJ-45 jack.
6. Connect the suppressor's ground stud to a grounding point. Use the appropriate wire gauge and type, keeping the wire as short as possible, less than 1m (3 feet), between the stud and the site grounding point.
7. Replace the cover.

Note *There may also be regulatory requirements to cross bond the ODU-IDU CAT-5e cable at regular intervals up the mast. This may be as frequent as every 10 meters (33 feet).*

A second Surge Arrestor Unit should be mounted at the building entry point and must be grounded, as shown in *Figure D-3* above.

➤ **To mount the lightning protection at the building entry point:**

1. Mount the device outside the building, located as near as possible to the entrance of the CAT-5e ODU-IDU cable. Mount the unit so that the cable connectors are at the bottom (to prevent water from penetrating), with the strain reliefs facing the ground.
2. Remove the cover by unscrewing the front of the unit.
3. Mount the unit to an outside surface using the two mounting holes.
4. Connect the ODU-IDU cable using the RJ-45 jack.
5. Connect one cable between the IDU and the suppressor using an RJ-45 jack.
6. Connect the suppressor's ground stud to a grounding point. Use the appropriate wire gauge and type, keeping the wire as short as possible, less than 1m (3'), between the stud and the site grounding point.
7. Replace the cover

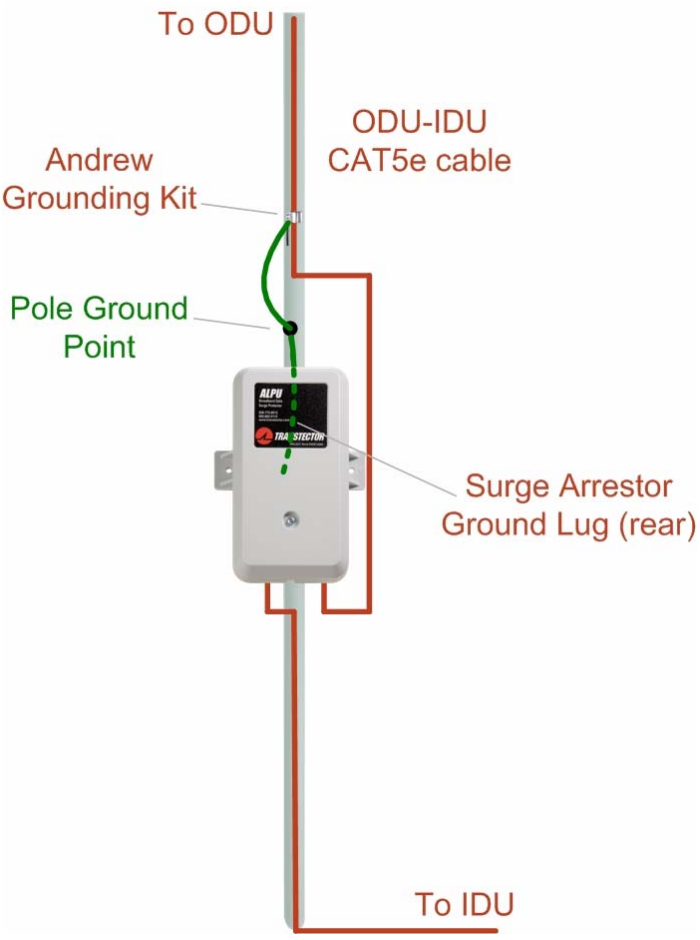


Figure D-6. Surge Suppressor and Grounding at Building Entry Point

Appendix E

MIB Reference

The RAD MIB is a set of APIs that enables external applications to control RAD equipment.

The MIB is divided into public and a private API groups:

- Public: RFC-1213 (MIB II) variables, RFC-1214 (MIB II) System and Interfaces sections
- Private: Controlled by RAD and supplements the public group.

This appendix describes the public and private MIB used by RAD.

The following terms are used in this appendix.

- MIB – Management Information Base
- API – Application Programming Interface
- SNMP – Simple Network Management Protocol.

E.1 Interface API

The Airmux Manager application provides all the means to configure and monitor an Airmux-400 link, communicating with the SNMP agent in each ODU. Each SNMP agent contains data on each of the IDUs and ODUs in the link. Both agents communicate with each other over the air using a proprietary protocol.

Note *Each ODU has a single MAC address and a single IP address.*

To control and configure the device using the MIB, you should adhere to the following rules:

- The connection for control and configuration is to the local site, over any SNMP/UDP/IP network.
- All Parameters should be consistent between both of the ODUs. Note that inconsistency of air parameters can break the air connection. To correct air parameters inconsistency you must reconfigure each of the ODUs.
- Common practice is to configure the remote site first and then to configure the local site.
- For some of the configuration parameters additional action must be taken before the new value is loaded. Please refer to the operation in the parameters description.

- Some of the MIB parameters values are product dependent. It is strongly recommend using the AirMux Manager Application for changing these values. Setting wrong values may cause indeterminate results.

To control a link, all SNMP requests should go to the local site IP address.

The AirMux Manager uses the Read Community strings ***public*** for the local ODU and ***public-remote*** for the remote ODU. It uses Write Community strings ***netman*** for the local ODU and ***netman-remote*** for the remote ODU. These are the actory defaults. f

E.2 Private MIB Structure

The sections in the private RAD MIB and its location in the MIB tree are shown in *Figure E-1*.

Figure E-1. Top Level Sections of the Private MIB

The products MIB section contains the definition of the Object IDs for the two form factors of the ODU, Integrated Antenna and Connectorized (referred in the MIB as **external antenna**):

The ODU MIB contains the sections: Admin, Service, Ethernet, Bridge, Air, PerfMon and Agent.

The IDU MIB contains the sections: Admin, Service, Ethernet, Bridge and TDM.

The general MIB include a single generic parameter that is used by all traps as a trap description parameter.

E.3 MIB Parameters

The following section describes all of the MIB parameters. The MIB parameters follow the following naming convention:

‹airmux400›‹Section 1›...‹Section n›‹Parameter Name›

For each of the configuration and control parameters (parameters with read-write access), the "Description" column describes when the new value is effective. It is recommended that you perform the appropriate action to make the values affective immediately after any change. Where a change is required on both sides of the link, it is recommended that you change both sides of the link first and then perform the action.

RFC 1213 Variables

Table E-1 lists the RFC 1213 MIB variables supported by Airmux-400. Letter **x** in OID stands for interface ID.

Table E-1. Supported RFC 1213 Variables

Name	OID	Type	Access	Description
ifIndex	.1.3.6.1.2.1.2.2.1.1.x	Integer	RO	A unique value for each interface. Its value ranges between 1 and the value of ifNumber. The value for each interface must remain constant at least from one re-initialization of the entity's network management system to the next re-initialization.
ifDescr	.1.3.6.1.2.1.2.2.1.2	DisplayString	RO	A textual string containing information about the interface.This string should include the name of the manufacturer, the product name and the version of the hardware interface.

Name	OID	Type	Access	Description
ifType	.1.3.6.1.2.1.2.2.1.3	Integer	RO	The type of interface, distinguished according to the physical/link protocol(s) immediately `below' the network layer in the protocol stack.
ifSpeed	.1.3.6.1.2.1.2.2.1.5	Gauge	RO	An estimate of the interface's current bandwidth in bits per second.For interfaces which do not vary in bandwidth or for those where no accurate estimation can be made, this object should ontain the nominal bandwidth.
ifPhysAddress	.1.3.6.1.2.1.2.2.1.6	Phys-Address	RO	The interface's address at the protocol layer immediately `below' the network layer in the protocol stack. For interfaces which do not have such an address (e.g., a serial line), this object should contain an octet string of zero length.
ifAdminStatus	.1.3.6.1.2.1.2.2.1.7	Integer	RW	The desired state of the interface. The testing(3) state indicates that no operational packets can be passed.
ifOperStatus	.1.3.6.1.2.1.2.2.1.8	Integer	RO	The current operational state of the interface. The testing(3) state indicates that no operational packets can be passed.
ifInOctets	.1.3.6.1.2.1.2.2.1.10.x	Counter	RO	The total number of octets received on the interface, including framing characters.
ifInUcastPkts	.1.3.6.1.2.1.2.2.1.11.x	Counter	RO	The number of subnetwork-unicast packets delivered to a higher-layer protocol.
ifInNUcastPkts	.1.3.6.1.2.1.2.2.1.12.x	Counter	RO	The number of non-unicast (i.e., subnetwork-broadcast or subnetwork-multicast) packets delivered to a higher-layer protocol.
ifInErrors	.1.3.6.1.2.1.2.2.1.14.x	Counter	RO	The number of inbound packets that contained errors preventing them from being deliverable to a higher-layer protocol.
ifOutOctets	.1.3.6.1.2.1.2.2.1.16.x	Counter	RO	The total number of octets transmitted out of the interface, including framing characters.
ifOutUcastPkts	.1.3.6.1.2.1.2.2.1.17.x	Counter	RO	The total number of packets that higher-level protocols requested be transmitted to a subnetwork-unicast address, including those that were discarded or not sent.

Name	OID	Type	Access	Description
ifOutNUcastPkts	.1.3.6.1.2.1.2.2.1.18.x	Counter	RO	The total number of packets that higher-level protocols requested be transmitted to a non-unicast (i.e., a subnetwork-broadcast or subnetwork-multicast) address, including those that were discarded or not sent.

MIB Parameters

Table E-2 lists parameters of the private RAD MIB.

Table E-2. Private MIB Parameters

Name	OID	Type	Access	Description
airmux400OduAdmProductType	1.3.6.1.4.1.4458.1000.1.1.1	DisplayString	RO	ODU configuration description.
airmux400OduAdmHwRev	1.3.6.1.4.1.4458.1000.1.1.2	DisplayString	RO	ODU Hardware Version.
airmux400OduAdmSwRev	1.3.6.1.4.1.4458.1000.1.1.3	DisplayString	RO	ODU Software Version.
airmux400OduAdmLinkName	1.3.6.1.4.1.4458.1000.1.1.4	DisplayString	RW	Link Name. A change is effective immediately.
airmux400OduAdmResetCmd	1.3.6.1.4.1.4458.1000.1.1.5	Integer	RW	Reset Command. A set command with a value of 3 will cause a device reset. The read value is always 0.
airmux400OduAdmAddres	1.3.6.1.4.1.4458.1000.1.1.6	IpAddress	RW	ODU IP address. A change is effective after reset. The parameter is kept for backward compatibility. Using the alternative parameter: airmux400OduAdmIpParamsCnfg is recommended.
airmux400OduAdmMask	1.3.6.1.4.1.4458.1000.1.1.7	IpAddress	RW	ODU Subnet Mask. A change is effective after reset. The parameter is kept for backward compatibility. Using the alternative parameter: airmux400OduAdmIpParamsCnfg is recommended.
airmux400OduAdmGateway	1.3.6.1.4.1.4458.1000.1.1.8	IpAddress	RW	ODU default gateway. A change is effective after reset. The parameter is kept for backward compatibility. Using the alternative parameter: airmux400OduAdmIpParamsCnfg is recommended.
airmux400OduAdmBroadcast	1.3.6.1.4.1.4458.1000.1.1.10	Integer	RW	This parameter is reserved for the Manager application provided with the product.
airmux400OduAdmHostsTable			N/A	Trap destinations table. Each trap destination is defined by an IP address and a UDP port. Up to 10 addresses can be configured.

Name	OID	Type	Access	Description
airmux400OduAdmHostsEntry			N/A	Trap destinations table entry.
airmux400OduAdmHostsIndex			RO	Trap destinations table index.
airmux400OduAdmHostsIp	1.3.6.1.4.1.4458.1000.1.1.12.1.2	IpAddress	RW	Trap destination IP address. A change is effective immediately.
airmux400OduAdmHostsPort	1.3.6.1.4.1.4458.1000.1.1.12.1.3	Integer	RW	UDP port of the trap destination. A change is effective immediately.
airmux400OduBuzzerAdminState	1.3.6.1.4.1.4458.1000.1.1.13	Integer	RW	This parameter controls the activation of the buzzer while the unit is in install mode. A change is effective immediately. The valid values are: disabled (0) enabled (1).
airmux400OduProductId	1.3.6.1.4.1.4458.1000.1.1.14	DisplayString	RO	This parameter is reserved for the Manager application provided with the product.
airmux400OduReadCommunity	1.3.6.1.4.1.4458.1000.1.1.15	DisplayString	RW	Read Community String. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Read Community String. The SNMP agent accepts only encrypted values.
airmux400OduReadWriteCommunity	1.3.6.1.4.1.4458.1000.1.1.16	DisplayString	RW	Read/Write Community String. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Read/Write Community String. The SNMP agent accepts only encrypted values.
airmux400OduTrapCommunity	1.3.6.1.4.1.4458.1000.1.1.17	DisplayString	RW	Trap Community String. This parameter is used by the Manager application to change the Trap Community String. The SNMP agent accepts only encrypted values.
airmux400OduAdmSnmpAgentVersion	1.3.6.1.4.1.4458.1000.1.1.18	Integer	RO	Major version of the SNMP agent.
airmux400OduAdmRemoteSiteName	1.3.6.1.4.1.4458.1000.1.1.19	DisplayString	RO	Remote site name. Returns the same value as sysLocation parameter of the remote site.
airmux400OduAdmSnmpAgentMinorVersion	1.3.6.1.4.1.4458.1000.1.1.20	Integer	RO	Minor version of the SNMP agent.
airmux400OduAdmLinkPassword	1.3.6.1.4.1.4458.1000.1.1.21	DisplayString	RW	Link Password. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Link Password. The SNMP agent accepts only encrypted values.

Name	OID	Type	Access	Description
airmux400OduAdmSiteLinkPassword	1.3.6.1.4.1.4458.1000.1.1.22	DisplayString	RW	Site Link Password. This parameter always returns ***** when retrieving its value. It is used by the Manager application to change the Link Password of the site. The SNMP agent accepts only encrypted values.
airmux400OduAdmDefaultPassword	1.3.6.1.4.1.4458.1000.1.1.23	Integer	RO	This parameter indicates if the current Link Password is the default password.
airmux400OduAdmConnectionType	1.3.6.1.4.1.4458.1000.1.1.24	Integer	RO	This parameter indicates if the Manager application is connected to the local ODU or to the remote ODU over the air. A value of 'unknown' indicates community string mismatch.
airmux400OduAdmBackToFactorySettingsCmd	1.3.6.1.4.1.4458.1000.1.1.25	Integer	RW	Back to factory settings Command. A change is effective after reset. The read value is always 0.
airmux400OduAdmIpParamsCnfg	1.3.6.1.4.1.4458.1000.1.1.26	DisplayString	RW	ODU IP address Configuration. The format is: <IP_Address>|<Subnet_Mask>|<Default_Gateway>|
airmux400OduAdmVlanID	1.3.6.1.4.1.4458.1000.1.1.27	Integer	RW	VLAN ID. Valid values are 1 to 4094. Initial value is 0 meaning VLAN unaware.
airmux400OduAdmVlanPriority	1.3.6.1.4.1.4458.1000.1.1.28	Integer	RW	VLAN Priority. 0 is lowest priority 7 is highest priority.
airmux400OduAdmSN	1.3.6.1.4.1.4458.1000.1.1.29	DisplayString	RO	IDU Serial Number
airmux400OduSrvMode	1.3.6.1.4.1.4458.1000.1.2.1	Integer	RW	System mode. The only value that can be set is installMode; normalMode reserved to the Manager application provided with the product. A change is effective after link re-synchronization.
airmux400OduSrvBridging	1.3.6.1.4.1.4458.1000.1.2.3	Integer	RO	Bridging Mode. Valid values are: disabled (0) enabled (1).
airmux400OduEthernetRemainingRate	1.3.6.1.4.1.4458.1000.1.3.1	Integer	RO	Current Ethernet bandwidth in bps.
airmux400OduEthernetIfTable			N/A	ODU Ethernet Interface table.
airmux400OduEthernetIfEntry			N/A	ODU Ethernet Interface table entry.
airmux400OduEthernetIfIndex	1.3.6.1.4.1.4458.1000.1.3.2.1.1	Integer	RO	ODU Ethernet Interface Index.
airmux400OduEthernetIfAddress	1.3.6.1.4.1.4458.1000.1.3.2.1.5	DisplayString	RO	ODU MAC address.
airmux400OduEthernetIfAdminStatus	1.3.6.1.4.1.4458.1000.1.3.2.1.6	Integer	RW	Required state of the interface.
airmux400OduEthernetIfOperStatus	1.3.6.1.4.1.4458.1000.1.3.2.1.7	Integer	RO	Current operational state of the interface.

Name	OID	Type	Access	Description
airmux400OduEthernetIfFailAction	1.3.6.1.4.1.4458.1000.1.3.2.1.8	Integer	RW	Failure action of the interface.
airmux400OduEthernetNumOfPorts	1.3.6.1.4.1.4458.1000.1.3.3	Integer	RO	Number of ODU network interfaces.
airmux400OduBridgeBasePortTable			N/A	ODU Bridge Ports table.
airmux400OduBridgeBasePortEntry			N/A	ODU Bridge Ports table entry.
airmux400OduBridgeBasePortIndex			RO	ODU Bridge Port Number.
airmux400OduBridgeBaseIfIndex			RO	IfIndex corresponding to ODU Bridge port.
airmux400OduBridgeTpMode	1.3.6.1.4.1.4458.1000.1.4.4.101	Integer	RW	ODU bridge mode. A change is effective after reset. Valid values: hubMode (0) bridgeMode (1).
airmux400OduBridgeTpPortTable			N/A	ODU Transparent Bridge Ports table.
airmux400OduBridgeTpPortEntry			N/A	ODU Transparent Bridge Ports table entry.
airmux400OduBridgeTpPortIndex			RO	ODU Transparent Bridge Port Number.
airmux400OduBridgeTpPortInFrames	1.3.6.1.4.1.4458.1000.1.4.4.3.1.3	Counter	RO	Number of frames received by this port.
airmux400OduBridgeTpPortOutFrames	1.3.6.1.4.1.4458.1000.1.4.4.3.1.4	Counter	RO	Number of frames transmitted by this port.
airmux400OduBridgeTpPortInBytes	1.3.6.1.4.1.4458.1000.1.4.4.3.1.101	Counter	RO	Number of bytes received by this port.
airmux400OduBridgeTpPortOutBytes	1.3.6.1.4.1.4458.1000.1.4.4.3.1.102	Counter	RO	Number of bytes transmitted by this port.
airmux400OduAirFreq	1.3.6.1.4.1.4458.1000.1.5.1	Integer	RW	Installation Center Frequency. Valid values are product dependent. A change is effective after link re-synchronization.
airmux400OduAirDesiredRate	1.3.6.1.4.1.4458.1000.1.5.2	Integer	RW	Deprecated parameter actual behavior is read-only. Required Air Rate. For Channel Bandwidth of 20 10 5 MHz divide the value by 1 2 4 respectively.
airmux400OduAirSSID	1.3.6.1.4.1.4458.1000.1.5.3	DisplayString	RW	Reserved for the Manager application provided with the product.
airmux400OduAirTxPower	1.3.6.1.4.1.4458.1000.1.5.4	Integer	RW	Required Transmit power in dBm . This is a nominal value while the actual transmit power includes additional attenuation. The min and max values are product specific. A change is effective immediately.
airmux400OduAirSesState	1.3.6.1.4.1.4458.1000.1.5.5	Integer	RO	Current Link State. The value is active (3) during normal operation.

Name	OID	Type	Access	Description
airmux400OduAirMstrSlv	1.3.6.1.4.1.4458.1000.1.5.6	Integer	RO	This parameter indicates if the device was automatically selected into the radio link master or slave. The value is undefined if there is no link.
airmux400OduAirResync	1.3.6.1.4.1.4458.1000.1.5.8	Integer	RW	Setting this parameter to 1 will cause the link to restart the synchronization process.
airmux400OduAirRxPower	1.3.6.1.4.1.4458.1000.1.5.9.1	Integer	RO	Received Signal Strength in dBm.
airmux400OduAirTotalFrames	1.3.6.1.4.1.4458.1000.1.5.9.2	Counter	RO	Total Number of received radio frames.
airmux400OduAirBadFrames	1.3.6.1.4.1.4458.1000.1.5.9.3	Counter	RO	Total number of received radio frames with CRC error.
airmux400OduAirCurrentRate	1.3.6.1.4.1.4458.1000.1.5.9.4	Integer	RO	Deprecated parameter. Actual rate of the air interface in Mbps. For Channel Bandwidth of 20 10 5 MHz divide the value by 1 2 4 respectively.
airmux400OduAirCurrentRateIdx	1.3.6.1.4.1.4458.1000.1.5.9.5	Integer	RO	Index of current air rate.
airmux400OduAirTxPower36	1.3.6.1.4.1.4458.1000.1.5.10	Integer	RW	Deprecated parameter. Actual behavior is read-only.
airmux400OduAirTxPower48	1.3.6.1.4.1.4458.1000.1.5.11	Integer	RW	Deprecated parameter. Actual behavior is read-only.
airmux400OduAirCurrentTxPower	1.3.6.1.4.1.4458.1000.1.5.12	Integer	RO	Current Transmit Power in dBm. This is a nominal value while the actual transmit power includes additional attenuation.
airmux400OduAirMinFrequency	1.3.6.1.4.1.4458.1000.1.5.13	Integer	RO	Minimum center frequency in MHz.
airmux400OduAirMaxFrequency	1.3.6.1.4.1.4458.1000.1.5.14	Integer	RO	Maximum center frequency in MHz.
airmux400OduAirFreqResolution	1.3.6.1.4.1.4458.1000.1.5.15	Integer	RO	Center Frequency resolution. Measured in MHz if value < 100 otherwise in KHz.
airmux400OduAirCurrentFreq	1.3.6.1.4.1.4458.1000.1.5.16	Integer	RO	Current Center Frequency. Measured in MHz if center frequency resolution value < 100 otherwise in KHz.
airmux400OduAirNumberOfChannels	1.3.6.1.4.1.4458.1000.1.5.17	Integer	RO	Number of channels that can be used.
airmux400OduAirChannelsTable			N/A	Table of channels used by automatic channels selection (ACS).
airmux400OduAirChannelsEntry			N/A	ACS channels table entry.
airmux400OduAirChannelsIndex	1.3.6.1.4.1.4458.1000.1.5.18.1.1	Integer	RO	Channel Index.

Name	OID	Type	Access	Description
airmux400OduAirChannelsFrequency	1.3.6.1.4.1.4458.1000.1.5.18.1.2	Integer	RO	Channel frequency in MHz.
airmux400OduAirChannelsOperState	1.3.6.1.4.1.4458.1000.1.5.18.1.3	Integer	RW	Channel state. Can be set by the user. Automatic Channel Selection uses channels that are AirChannelsOperState enabled and AirChannelsAvail enabled. A change is effective after link re-synchronization. Valid values: disabled (0) enabled (1).
airmux400OduAirChannelsAvail	1.3.6.1.4.1.4458.1000.1.5.18.1.4	Integer	RO	Channel state. Product specific and cannot be changed by the user. Automatic Channel Selection uses channels that are AirChannelsOperState enabled and AirChannelsAvail enabled. Valid values: disabled (0) enabled (1).
airmux400OduAirDfsState	1.3.6.1.4.1.4458.1000.1.5.19	Integer	RO	Radar detection state. Valid values: disabled (0) enabled (1).
airmux400OduAirAutoChannelSelectionState	1.3.6.1.4.1.4458.1000.1.5.20	Integer	RO	Deprecated parameter. Indicating Automatic Channel Selection availability at current channel bandwidth. Valid values: disabled (0) enabled (1).
airmux400OduAirEnableTxPower	1.3.6.1.4.1.4458.1000.1.5.21	Integer	RO	Indicating Transmit power configuration enabled or disabled.
airmux400OduAirMinTxPower	1.3.6.1.4.1.4458.1000.1.5.22	Integer	RO	Minimum Transmit power in dBm.
airmux400OduAirMaxTxPowerTable			N/A	Table of Maximum transmit power per air rate in dBm.
airmux400OduAirMaxTxPowerEntry			N/A	Maximum Transmit power table entry.
airmux400OduAirMaxTxPowerIndex	1.3.6.1.4.1.4458.1000.1.5.23.1.1	Integer	RO	Air interface rate index.
airmux400OduAirMaxTxPower	1.3.6.1.4.1.4458.1000.1.5.23.1.2	Integer	RO	Maximum Transmit power in dBm.
airmux400OduAirChannelBandwidth	1.3.6.1.4.1.4458.1000.1.5.24	Integer	RW	Channel bandwidth in KHz. A change is effective after reset.
airmux400OduAirChannelBWTable			N/A	Channel Bandwidths table.
airmux400OduAirChannelBWEntry			N/A	Channel Bandwidth table entry.
airmux400OduAirChannelBWIndex	1.3.6.1.4.1.4458.1000.1.5.25.1.1	Integer	RO	Channel Bandwidth index.
airmux400OduAirChannelBWAvail	1.3.6.1.4.1.4458.1000.1.5.25.1.2	Integer	RO	Channel Bandwidth availability product specific. Options are: Not supported supported with manual channel selection supported with Automatic Channel Selection.

Name	OID	Type	Access	Description
airmux400OduAirRFD	1.3.6.1.4.1.4458.1000.1.5.26	Integer	RO	Current radio frame duration in microseconds.
airmux400OduAirRatesTable			N/A	Air Rate indexes table for current channel bandwidth.
airmux400OduAirRatesEntry			N/A	Air Rate indexes table entry.
airmux400OduAirRatesIndex	1.3.6.1.4.1.4458.1000.1.5.27.1.1	Integer	RO	Air Rate index.
airmux400OduAirRatesAvail	1.3.6.1.4.1.4458.1000.1.5.27.1.2	Integer	RO	Air Rate availability depending on air interface conditions.
airmux400OduAirDesiredRateIdx	1.3.6.1.4.1.4458.1000.1.5.28	Integer	RW	Required Air Rate index. 0 reserved for Adaptive Rate. A change is effective immediately after Set operation to the master side while the link is up.
airmux400OduAirLinkDistance	1.3.6.1.4.1.4458.1000.1.5.29	Integer	RO	Link distance in meters. A value of -1 indicates an illegal value and is also used when a link is not established.
airmux400OduAirLinkWorkingMode	1.3.6.1.4.1.4458.1000.1.5.30	Integer	RO	Link working mode as a result of comparing versions of both sides of the link. Possible modes are: Unknown - no link Normal - versions on both sides are identical with full compatibility with restricted compatibility or versions on both sides are different with software upgrade or versions incompatibility.
airmux400OduAirMajorLinkIfVersion	1.3.6.1.4.1.4458.1000.1.5.31	Integer	RO	Major link interface version
airmux400OduAirMinorLinkIfVersion	1.3.6.1.4.1.4458.1000.1.5.32	Integer	RO	Minor link interface version
airmux400OduAirHssDesiredOpState	1.3.6.1.4.1.4458.1000.1.5.40.1	Integer	RW	Required Hub Site Synchronization operating state.
airmux400OduAirHssCurrentOpState	1.3.6.1.4.1.4458.1000.1.5.40.2	Integer	RO	Current Hub Site Synchronization operating state.
airmux400OduAirHssSyncStatus	1.3.6.1.4.1.4458.1000.1.5.40.3	Integer	RO	Hub Site Synchronization sync status.
airmux400OduAirHssExtPulseStatus	1.3.6.1.4.1.4458.1000.1.5.40.4	Integer	RO	Hub Site Synchronization external pulse detection status.
airmux400OduAirHssExtPulseType	1.3.6.1.4.1.4458.1000.1.5.40.5	Integer	RO	Hub Site Synchronization external pulse type.
airmux400OduAirHssDesiredExtPulseType	1.3.6.1.4.1.4458.1000.1.5.40.6	Integer	RW	Hub Site Synchronization required external pulse type. Valid values for read write: {typeA(2) typeB(3) typeC(4) typeD(5)}. Valid value for read only: {notApplicable(1)}.

Name	OID	Type	Access	Description
airmux400OduAirHssRfpTable			N/A	ODU Radio Frame Patterns (RFP) Table.
airmux400OduAirHssRfpEntry			N/A	ODU RFP Table entry.
airmux400OduAirHssRfpIndex	1.3.6.1.4.1.4458.1000.1.5.40.7.1.1	Integer	RO	ODU RFP Table index. The index represent the Radio Frame Pattern: typeA(2) typeB(3) typeC(4) typeD(5).
airmux400OduAirHssRfpEthChannelBW 5MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.2	Integer	RO	Represents the compatibility of Ethernet service under Channel BW of 5MHz in the specific Radio Frame Pattern.
airmux400OduAirHssRfpTdmChannelB W5MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.3	Integer	RO	Represents the compatibility of TDM service under Channel BW of 5MHz in the specific Radio Frame Pattern.
airmux400OduAirHssRfpEthChannelBW 10MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.4	Integer	RO	Represents the compatibility of Ethernet service under Channel BW of 10MHz in the specific Radio Frame Pattern.
airmux400OduAirHssRfpTdmChannelB W10MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.5	Integer	RO	Represents the compatibility of TDM service under Channel BW of 10MHz in the specific Radio Frame Pattern.
airmux400OduAirHssRfpEthChannelBW 20MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.6	Integer	RO	Represents the compatibility of Ethernet service under Channel BW of 20MHz in the specific Radio Frame Pattern.
airmux400OduAirHssRfpTdmChannelB W20MHz	1.3.6.1.4.1.4458.1000.1.5.40.7.1.7	Integer	RO	Represents the compatibility of TDM service under Channel BW of 20MHz in the specific Radio Frame Pattern.
airmux400OduAirLockRemote	1.3.6.1.4.1.4458.1000.1.5.41	Integer	RW	This parameter enables locking the link with a specific ODU. The following values can be set: Unlock (default) - The ODU is not locked on a specific remote ODU. Unlock can only be performed when the link is not connected. Lock - The ODU is locked on a specific remote ODU. Lock can only be performed when the link is active.
airmux400OduAirAntennaGain	1.3.6.1.4.1.4458.1000.1.5.42	Integer	RW	Current Antenna Gain in 0.1 dBi resolution. User defined value in case of external antenna. Legal range: MinAntennaGain< AntennaGain< MaxAntennaGain.
airmux400OduAirFeederLoss	1.3.6.1.4.1.4458.1000.1.5.43	Integer	RW	Current Feeder Loss in 0.1 dBm resolution. User defined value in case of external antenna.

Name	OID	Type	Access	Description
airmux400OduAirMaxAntennaGain	1.3.6.1.4.1.4458.1000.1.5.44	Integer	RO	Maximum allowed Antenna Gain in 0.1 dBi resolution.
airmux400OduAirMinAntennaGain	1.3.6.1.4.1.4458.1000.1.5.45	Integer	RO	Minimum allowed Antenna Gain in 0.1 dBi resolution.
airmux400OduAirMaxEIRP	1.3.6.1.4.1.4458.1000.1.5.46	Integer	RO	Maximum EIRP value as defined by regulation in 0.1 dBm resolution.
airmux400OduAirAntennaGainConfigSupport	1.3.6.1.4.1.4458.1000.1.5.47	Integer	RO	Antenna Gain Configurability options are product specific: supported not supported.
airmux400OduAirAntennaType	1.3.6.1.4.1.4458.1000.1.5.48	Integer	RW	External Antenna Type: Monopolar or Bipolar.
airmux400OduAirRssBalance	1.3.6.1.4.1.4458.1000.1.5.49	Integer	RO	RSS balance. Relation between RSS in radio 1 and RSS in radio 2.
airmux400OduAirTotalTxPower	1.3.6.1.4.1.4458.1000.1.5.50	Integer	RO	Total Transmit Power in dBm. This is a nominal value While the actual transmit power includes additional attenuation.
airmux400OduPerfMonCurrTable			N/A	This table defines/keeps the counters of the current 15 min interval.
airmux400OduPerfMonCurrEntry			N/A	This is an entry in the Current Interval Table.
airmux400OduPerfMonCurrUAS	1.3.6.1.4.1.4458.1000.1.6.1.1.1	Gauge	RO	The current number of Unavailable Seconds starting from the present 15 minutes period.
airmux400OduPerfMonCurrES	1.3.6.1.4.1.4458.1000.1.6.1.1.2	Gauge	RO	Current number of Errored Seconds starting from the present 15 minutes period.
airmux400OduPerfMonCurrSES	1.3.6.1.4.1.4458.1000.1.6.1.1.3	Gauge	RO	Current number of Severely Errored Seconds starting from the present 15 minutes period.
airmux400OduPerfMonCurrBBE	1.3.6.1.4.1.4458.1000.1.6.1.1.4	Gauge	RO	Current number of Background Block Errors starting from the present 15 minutes period.
airmux400OduPerfMonCurrIntegrity	1.3.6.1.4.1.4458.1000.1.6.1.1.5	Integer	RO	Indicates the integrity of the entry.
airmux400OduPerfMonIntervalTable			N/A	This table defines/keeps the counters of the current 15 min interval.
airmux400OduPerfMonIntervalEntry			N/A	This is an entry in the Interval Table.
airmux400OduPerfMonIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.

Name	OID	Type	Access	Description
airmux400OduPerfMonIntervalUAS			RO	The current number of Unavailable Seconds per interval.
airmux400OduPerfMonIntervalES			RO	Current number of Errored Seconds per interval.
airmux400OduPerfMonIntervalSES			RO	Current number of Severely Errored Seconds per interval.
airmux400OduPerfMonIntervalBBE			RO	Current number of Background Block Errors per interval.
airmux400OduPerfMonIntervalIntegrity			RO	Indicates the integrity of the entry per interval.
airmux400OduPerfMonDayTable			N/A	This table defines/keeps the counters of the current 15 min interval.
airmux400OduPerfMonDayEntry			N/A	This is an entry in the Days Table.
airmux400OduPerfMonDayIdx			RO	This table is indexed per interval number. Each interval is of 24 hours and the oldest is 30.
airmux400OduPerfMonDayUAS			RO	The current number of Unavailable Seconds per interval of 24 hours.
airmux400OduPerfMonDayES			RO	Current number of Errored Seconds per interval of 24 hours.
airmux400OduPerfMonDaySES			RO	Current number of Severely Errored Seconds per interval of 24 hours.
airmux400OduPerfMonDayBBE			RO	Current number of Background Block Errors per interval of 24 hours.
airmux400OduPerfMonDayIntegrity			RO	Indicates the integrity of the entry per interval of 24 hours.
airmux400OduPerfMonAirCurrTable			N/A	This table defines/keeps the counters of the current 15 min interval.
airmux400OduPerfMonAirCurrEntry			N/A	This is an entry in the Current Interval Table.
airmux400OduPerfMonAirCurrMinRSL	1.3.6.1.4.1.4458.1000.1.6.4.1.1	Integer	RO	Current Min Received Level Reference starting from the present 15 minutes period.
airmux400OduPerfMonAirCurrMaxRSL	1.3.6.1.4.1.4458.1000.1.6.4.1.2	Integer	RO	Current Max Received Level Reference starting from the present 15 minutes period.
airmux400OduPerfMonAirCurrRSLThresh1Exceed	1.3.6.1.4.1.4458.1000.1.6.4.1.3	Gauge	RO	Number of seconds Receive Signal Level exceeded the RSL1 threshold in the last 15 minutes.

Name	OID	Type	Access	Description
airmux400OduPerfMonAirCurrRSLThresh2Exceed	1.3.6.1.4.1.4458.1000.1.6.4.1.4	Gauge	RO	Number of seconds Receive Signal Level exceeded the RSL2 threshold in the last 15 minutes.
airmux400OduPerfMonAirCurrMinTSL	1.3.6.1.4.1.4458.1000.1.6.4.1.5	Integer	RO	Current Min Transmit Signal Level starting from the present 15 minutes period.
airmux400OduPerfMonAirCurrMaxTSL	1.3.6.1.4.1.4458.1000.1.6.4.1.6	Integer	RO	Current Max Transmit Signal Level starting from the present 15 minutes period.
airmux400OduPerfMonAirCurrTSLThresh1Exceed	1.3.6.1.4.1.4458.1000.1.6.4.1.7	Gauge	RO	Number of seconds Transmit Signal Level exceeded the TSL1 threshold in the last 15 minutes.
airmux400OduPerfMonAirCurrBBERThresh1Exceed	1.3.6.1.4.1.4458.1000.1.6.4.1.8	Gauge	RO	Number of seconds Background Block Error Ratio exceeded the BBER1 threshold in the last 15 minutes.
airmux400OduPerfMonAirIntervalTable			N/A	This table defines/keeps the counters of the current 15 min interval.
airmux400OduPerfMonAirIntervalEntry			N/A	This is an entry in the Interval Table.
airmux400OduPerfMonAirIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
airmux400OduPerfMonAirIntervalMinRSL			RO	Current Min Received Level Reference per interval.
airmux400OduPerfMonAirIntervalMaxRSL			RO	Current Max Received Level Reference per interval.
airmux400OduPerfMonAirIntervalRSLThresh1Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL1 threshold per interval.
airmux400OduPerfMonAirIntervalRSLThresh2Exceed				Number of seconds Receive Signal Level exceeded the RSL2 threshold ACCESS read-only per interval.
airmux400OduPerfMonAirIntervalMinTSL			RO	Current Min Transmit Signal Level per interval.
airmux400OduPerfMonAirIntervalMaxTSL			RO	Current Max Transmit Signal Level per interval.
airmux400OduPerfMonAirIntervalTSLThresh1Exceed			RO	Number of seconds Transmit Signal Level exceeded the TSL1 threshold per interval.
airmux400OduPerfMonAirIntervalBBERThresh1Exceed			RO	Number of seconds Background Block Error Ratio exceeded the BBER1 threshold per interval.

Name	OID	Type	Access	Description
airmux400OduPerfMonAirDayTable			N/A	This table defines/keeps the counters of the current 15 min interval.
airmux400OduPerfMonAirDayEntry			N/A	This is an entry in the Days Table.
airmux400OduPerfMonAirDayIdx			RO	This table is indexed per Day number. Each Day is of 15 minutes and the oldest is 96.
airmux400OduPerfMonAirDayMinRSL			RO	Current Min Received Level Reference per Day.
airmux400OduPerfMonAirDayMaxRSL			RO	Current Max Received Level Reference per Day.
airmux400OduPerfMonAirDayRSLThresh1Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL1 threshold per Day.
airmux400OduPerfMonAirDayRSLThresh2Exceed			RO	Number of seconds Receive Signal Level exceeded the RSL2 threshold per Day.
airmux400OduPerfMonAirDayMinTSL			RO	Current Min Transmit Signal Level per Day.
airmux400OduPerfMonAirDayMaxTSL			RO	Current Max Transmit Signal Level per Day.
airmux400OduPerfMonAirDayTSLThresh1Exceed			RO	Number of seconds Transmit Signal Level exceeded the TSL1 threshold per Day.
airmux400OduPerfMonAirDayBBERThresh1Exceed			RO	Number of seconds Background Block Error Ratio exceeded the BBER1 threshold per Day.
airmux400OduPerfMonEthCurrTable			N/A	This table defines/keeps the counters of the current 15 min interval.
airmux400OduPerfMonEthCurrEntry			N/A	This is an entry in the Current Interval Table.
airmux400OduPerfMonEthCurrRxMBytes	1.3.6.1.4.1.4458.1000.1.6.7.1.1	Gauge	RO	Current RX Mega Bytes starting from the present 15 minutes period.
airmux400OduPerfMonEthCurrTxMBytes	1.3.6.1.4.1.4458.1000.1.6.7.1.2	Gauge	RO	Current Transmit Mega Bytes starting from the present 15 minutes period.
airmux400OduPerfMonEthIntervalTable			N/A	This table defines/keeps the counters of the current 15 min interval.
airmux400OduPerfMonEthIntervalEntry			N/A	This is an entry in the Interval Table.
airmux400OduPerfMonEthIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
airmux400OduPerfMonEthIntervalRxMBytes			RO	Current RX Mega Bytes per interval.

Name	OID	Type	Access	Description
airmux400OduPerfMonEthIntervalTxMBytes			RO	Current Transmit Mega Bytes per interval.
airmux400OduPerfMonEthDayTable			N/A	This table defines/keeps the counters of the current 15 min interval.
airmux400OduPerfMonEthDayEntry			N/A	This is an entry in the Days Table.
airmux400OduPerfMonEthDayIdx			RO	This table is indexed per Day number. Each Day is of 15 minutes and the oldest is 96.
airmux400OduPerfMonEthDayRxMBytes			RO	Current RX Mega Bytes per day.
airmux400OduPerfMonEthDayTxMBytes			RO	Current Transmit Mega Bytes per day.
airmux400OduPerfMonTdmCurrTable			N/A	This table defines/keeps the counters of the current 15 min interval.
airmux400OduPerfMonTdmCurrEntry			N/A	This is an entry in the Current Interval Table.
airmux400OduPerfMonTdmCurrActiveSeconds			RO	Parameter indicating whether the TDM service was active. Under TDM backup link the parameter indicates whether the backup link was active.
airmux400OduPerfMonTdmIntervalTable			N/A	This table defines/keeps the counters of the current 15 min interval.
airmux400OduPerfMonTdmIntervalEntry			N/A	This is an entry in the Interval Table.
airmux400OduPerfMonTdmIntervalIdx			RO	This table is indexed per interval number. Each interval is of 15 minutes and the oldest is 96.
airmux400OduPerfMonTdmIntervalActiveSeconds			RO	Parameter indicating whether the TDM service was active. Under TDM backup link the parameter indicates whether the backup link was active.
airmux400OduPerfMonTdmDayTable			N/A	This table defines/keeps the counters of the current 15 min interval.
airmux400OduPerfMonTdmDayEntry			N/A	This is an entry in the Days Table.
airmux400OduPerfMonTdmDayIdx			RO	This table is indexed per Day number. Each Day is of 15 minutes and the oldest is 96.
airmux400OduPerfMonTdmDayActiveSeconds			RO	Parameter indicating whether the TDM service was active. Under TDM backup link the parameter

Name	OID	Type	Access	Description
				indicates whether the backup link was active.
airmux400OduPerfMonTxThresh1	1.3.6.1.4.1.4458.1000.1.6.20	Integer	RW	When the Transmit power exceeds this threshold a performance monitoring TSL1 counter is incremented.
airmux400OduPerfMonRxThresh1	1.3.6.1.4.1.4458.1000.1.6.21	Integer	RW	When the RX power exceeds this threshold a performance monitoring RSL1 counter is incremented.
airmux400OduPerfMonRxThresh2	1.3.6.1.4.1.4458.1000.1.6.22	Integer	RW	When the RX power exceeds this threshold a performance monitoring RSL2 counter is incremented.
airmux400OduPerfMonBBERThresh1	1.3.6.1.4.1.4458.1000.1.6.23	Integer	RW	When the BBER exceeds this threshold a performance monitoring BBER counter is incremented. The units are 1/10 of a percent.
airmux400OduAgnGenAddTrapExt	1.3.6.1.4.1.4458.1000.1.7.1.1	Integer	RW	If 'yes' is chosen the ifIndex Unit Severity Time_T and Alarm Id from the airmux400OduAgnCurrAlarmTable will be bind to the end of each private trap.
airmux400OduAgnNTPCfgTimeServerIP	1.3.6.1.4.1.4458.1000.1.7.2.1	IpAddress	RW	IP address of the server from which the current time is loaded.
airmux400OduAgnNTPCfgTimeOffsetFromUTC	1.3.6.1.4.1.4458.1000.1.7.2.2	Integer	RW	Offset from Coordinated Universal Time (minutes). Possible values: -1440..1440.
airmux400OduAgnRealTimeAndDate	1.3.6.1.4.1.4458.1000.1.7.2.3	OctetString	RW	This parameter specifies the real time and date Format 'YYYY-MM-DD HH:MM:SS' (Hexadecimal). A date-time specification: field octets contents range ------ ------- ---------- -------- 1 1-2 year 0..65536 2 3 month 1..12 3 4 day 1.. 31 4 5 hour 0..23 5 6 minutes 0..59 6 7 seconds 0..60 (use 60 for leap-second) 7 8 deci-seconds 0..9

Name	OID	Type	Access	Description
				For example Tuesday May 26 1992 at 1:30:15 PM EDT would be displayed as: 07 c8 05 1a 0d 1e 0f 00 (1992 -5 -26 13:30:15)
airmux400OduAgnCurrAlarmLastChange	1.3.6.1.4.1.4458.1000.1.7.3.1	Integer	RO	This counter is initialized to 0 after a device reset and is incremented upon each change in the airmux400OduAgnCurrAlarmTable (either an addition or removal of an entry).
airmux400OduAgnCurrAlarmTable			N/A	This table includes the currently active alarms. When a RAISED trap is sent an alarm entry is added to the table. When a CLEAR trap is sent the entry is removed.
airmux400OduAgnCurrAlarmEntry			N/A	Entry containing the details of a currently RAISED trap.
airmux400OduAgnCurrAlarmCounter			RO	A running counter of active alarms. The counter is incremented for every new RAISED trap. It is cleared after a device reset.
airmux400OduAgnCurrAlarmSeverity			RO	Current Alarm severity.
airmux400OduAgnCurrAlarmId			RO	Unique Alarm Identifier (combines alarm type and interface). The same AlarmId is used for RAISED and CLEARED alarms.
airmux400OduAgnCurrAlarmIfIndex			RO	Interface Index where the alarm occurred. Alarms that are not associated with a specific interface will have the following value: 65535.
airmux400OduAgnCurrAlarmUnit			RO	Unit associated with the alarm.
airmux400OduAgnCurrAlarmTrapID			RO	ID of the raised trap that was sent when this alarm was raised.
airmux400OduAgnCurrAlarmTimeT			RO	Timestamp of this alarm. This number is in seconds from Midnight January 1st 1970.
airmux400OduAgnCurrAlarmText			RO	Alarm display text (same as the text in the sent trap).
airmux400IduAdmProductType	1.3.6.1.4.1.4458.1000.2.1.1	DisplayString	RO	IDU configuration description.
airmux400IduAdmHwRev	1.3.6.1.4.1.4458.1000.2.1.2	DisplayString	RO	IDU Hardware Revision.
airmux400IduAdmSwRev	1.3.6.1.4.1.4458.1000.2.1.3	DisplayString	RO	IDU Software Revision.

Name	OID	Type	Access	Description
airmux400OduAdmNumOfExternalAlarmIn	1.3.6.1.4.1.4458.1000.2.1.4	Integer	RO	Indicates the number of currently available External Alarm Inputs.
airmux400OduAdmExternAlarmInTable			N/A	This is the External Alarm Inputs table.
airmux400OduAdmExternAlarmInEntry			N/A	Entry containing the elements of a single External Alarm Input.
airmux400OduAdmExternAlarmInIndex	1.3.6.1.4.1.4458.1000.2.1.5.1.1	Integer	RO	This value indicates the index of the External Alarm Input entry.
airmux400OduAdmExternAlarmInText	1.3.6.1.4.1.4458.1000.2.1.5.1.2	DisplayString	RW	This field describes the External Alarm Input. It is an optional string of no more than 64 characters which will be used in the event being sent as a result of a change in the status of the External Alarm Input. DEFVAL {Alarm Description}
airmux400OduAdmExternAlarmInAdminState	1.3.6.1.4.1.4458.1000.2.1.5.1.3	Integer	RW	This value indicates if this External Alarm Input is enabled or disabled.
airmux400OduAdmExternAlarmInStatus	1.3.6.1.4.1.4458.1000.2.1.5.1.4	Integer	RO	This value indicates the current status of the External Alarm Input.
airmux400IduAdmSN	1.3.6.1.4.1.4458.1000.2.1.6	DisplayString	RO	IDU serial number
airmux400IduSrvDesiredTrunks	1.3.6.1.4.1.4458.1000.2.2.2	Integer	RW	Required trunks bitmap. Note that the number of possible trunks that can be configured may vary based on the IDU hardware configuration the selected air interface rate and the range of the installation. The provided Manager application enables the user to select only available configurations. A change is effective immediately if applied to a master unit and the link is in service mode.
airmux400IduSrvServices	1.3.6.1.4.1.4458.1000.2.2.4	ObjectID	RO	This parameter is reserved to the Manager application provided with the product.
airmux400IduSrvActiveTrunks	1.3.6.1.4.1.4458.1000.2.2.6	Integer	RO	A bitmap describing the currently open TDM trunks.
airmux400IduSrvAvailableTrunks	1.3.6.1.4.1.4458.1000.2.2.8	Integer	RO	A bitmap describing the number of TDM trunks that can be opened in the current configuration. The values take into account the IDU hardware configuration the air rate and the installation range.
airmux400IduSrvPossibleServicesTable			N/A	IDU Possible Services table.

Name	OID	Type	Access	Description
airmux400IduSrvPossibleServicesEntry			N/A	IDU services table entry.
airmux400IduSrvPossibleServicesIndex	1.3.6.1.4.1.4458.1000.2.2.10.1.1	Integer	RO	Table index Rate index of the air interface.
airmux400IduSrvPossibleTdmServices	1.3.6.1.4.1.4458.1000.2.2.10.1.2	Integer	RO	Deprecated parameter. A bitmap describing the TDM trunks that can be opened in the corresponding Air Rate.
airmux400IduSrvPossibleEthServices	1.3.6.1.4.1.4458.1000.2.2.10.1.3	Integer	RO	Deprecated parameter. This parameter describes if the Ethernet Service can be opened in the corresponding Air Rate. The valid values are: disabled (0) enabled (1).
airmux400IduSrvRemainingRate	1.3.6.1.4.1.4458.1000.2.2.10.1.4	Integer	RO	Current Ethernet bandwidth in bps per air rate.
airmux400IduSrvTrunkCost	1.3.6.1.4.1.4458.1000.2.2.10.1.5	Integer	RO	Cost of the TDM Service in bps.
airmux400IduSrvAvailServicesTable			N/A	ODU Possible TDM Services table.
airmux400IduSrvAvailServicesEntry			N/A	ODU TDM Services table entry.
airmux400IduSrvAvailServicesIndex	1.3.6.1.4.1.4458.1000.2.2.11.1.1	Integer	RO	Table index. The index is the bit mask of the TDM service.
airmux400IduSrvAvailServicesState	1.3.6.1.4.1.4458.1000.2.2.11.1.2	Integer	RO	Represents the TDM service availability.
airmux400IduSrvAvailServicesMinRateIdx	1.3.6.1.4.1.4458.1000.2.2.11.1.3	Integer	RO	Minimum rate index of the air interface which make the service possible.
airmux400IduSrvAvailServicesMaxRateIdx	1.3.6.1.4.1.4458.1000.2.2.11.1.4	Integer	RO	Maximum rate index of the air interface which make the service possible.
airmux400IduSrvAvailServicesReason	1.3.6.1.4.1.4458.1000.2.2.11.1.5	Integer	RO	Information about the TDM Service availability. - Not Applicable if the service is available. The reasons for TDM Service unavailability: - The available throughput isn't sufficient for Service demands; - The IDU HW doesn't support the service; - A Link Password mismatch was detected; - The external pulse type detected is improper for TDM services; - A Software versions mismatch was detected.
airmux400IduSrvEthActive	1.3.6.1.4.1.4458.1000.2.2.12	Integer	RO	Represents the Ethernet service activation state.
airmux400IduSrvEthAvailable	1.3.6.1.4.1.4458.1000.2.2.13	Integer	RO	Represents the Ethernet service availability state.
airmux400IduSrvEthThroughput	1.3.6.1.4.1.4458.1000.2.2.14	Gauge	RO	Current available Ethernet service throughput in bps.

Name	OID	Type	Access	Description
airmux400IduSrvEthMaxInfoRate	1.3.6.1.4.1.4458.1000.2.2.15	Integer	RW	Holds the maximum bandwidth (kbps) to be allocated for Ethernet service. Value of zero means that Ethernet service works as best effort. The maximum value is product specific. Refer to the user manual.
airmux400IduEthernetIfTable			N/A	IDU Ethernet Interface table.
airmux400IduEthernetIfEntry			N/A	IDU Ethernet Interface table entry.
airmux400IduEthernetIfIndex			RO	If Index corresponding to this Interface.
airmux400IduEthernetIfAddress	1.3.6.1.4.1.4458.1000.2.3.1.1.5	DisplayString	RO	IDU MAC address.
airmux400IduEthernetNumOfLanPorts	1.3.6.1.4.1.4458.1000.2.3.3	Integer	RO	Number of LAN interfaces in the IDU.
airmux400IduBridgeTpAging	1.3.6.1.4.1.4458.1000.2.4.4.2	Integer	RW	Timeout in seconds for aging. Note that for this parameter to be effective the ODU must be configured to HUB mode. A change is effective immediately.
airmux400IduTdmTxClockAvailStates	1.3.6.1.4.1.4458.1000.2.6.1.1	Integer	RO	Available states of the TDM Transmit Clock Control each input status is represented by a bit. When the state is available the bit value is 1. When the state is unavailable the bit value is 0. The available states are: bit 2 = Transparent. bit 3 = Local Loop Timed. bit 4 = Remote Loop Timed. bit 5 = Local Internal. bit 6 = Remote Internal.
airmux400IduTdmTxClockDesiredState	1.3.6.1.4.1.4458.1000.2.6.1.2	Integer	RW	Required state of the TDM Transmit Clock Control. A change is effective after re-activation of the TDM service.
airmux400IduTdmTxClockActualState	1.3.6.1.4.1.4458.1000.2.6.1.3	Integer	RO	Actual state of the TDM Transmit Clock Control.
airmux400IduTdmMasterClockAvailOptions	1.3.6.1.4.1.4458.1000.2.6.2.1	Integer	RO	Available options of the TDM Master Clock Control each input status is represented by a bit. When the option is available the bit value is 1. When the option is unavailable the bit value is 0. The available options are: bit 2 = Automatic. bit 3 = Trunk #1. bit 4 = Trunk #2. bit 5 = Trunk #3. bit 6 = Trunk #4. When no options are available the returned value is: 1
airmux400IduTdmMasterClockDesired	1.3.6.1.4.1.4458.1000.2.6.2.2	Integer	RW	Required TDM Master Clock. A change is effective after re-activation of the TDM service.
airmux400IduTdmMasterClockActual	1.3.6.1.4.1.4458.1000.2.6.2.3	Integer	RO	Actual Trunk used for TDM Master Clock.

Name	OID	Type	Access	Description
airmux400IduTdmConfigTable			N/A	IDU TDM Links Configuration table.
airmux400IduTdmConfigEntry			N/A	IDU TDM Links Configuration table entry.
airmux400IduTdmConfigIndex			RO	Table index.
airmux400IduTdmIfIndex			RO	Link index in the interface table.
airmux400IduTdmLineCoding	1.3.6.1.4.1.4458.1000.2.6.6.1.6	Integer	RW	This parameter applies to T1 trunks only. The parameter controls the line coding. Setting the value to each of the indices applies to all. A change is effective after the next open of the TDM service.
airmux400IduTdmLoopbackConfig	1.3.6.1.4.1.4458.1000.2.6.6.1.9	Integer	RW	Loop back configuration table. Each of the trunks can be set Normal Line loop back or Reverse line loop back. A change is effective immediately.
airmux400IduTdmLineStatus	1.3.6.1.4.1.4458.1000.2.6.6.1.10	Integer	RO	Line status.
airmux400IduTdmCurrentTable			N/A	IDU TDM Links Statistics table.
airmux400IduTdmCurrentEntry			N/A	IDU TDM Links Statistics table entry.
airmux400IduTdmCurrentIndex			RO	Table index (Same as airmux400IduTdmLineIndex).
airmux400IduTdmCurrentBlocks	1.3.6.1.4.1.4458.1000.2.6.7.1.101	Counter	RO	Number of correct blocks transmitted to the line.
airmux400IduTdmCurrentDrops	1.3.6.1.4.1.4458.1000.2.6.7.1.102	Counter	RO	Number of error blocks transmitted to the line.
airmux400IduTdmCurrentTxClock	1.3.6.1.4.1.4458.1000.2.6.7.1.103	Integer	RW	TDM Transmit Clock. A change is effective after re-activation of the TDM service.
airmux400IduTdmCurrentBlocksHigh	1.3.6.1.4.1.4458.1000.2.6.7.1.104	Counter	RO	High part of the 64 bits counter Current Blocks
airmux400IduTdmRemoteQual	1.3.6.1.4.1.4458.1000.2.6.8	Integer	RO	Estimated average interval between error second events. The valid values are 1-2^31 where a value of -1 is used to indicate an undefined state.
airmux400IduTdmRemoteQualEval	1.3.6.1.4.1.4458.1000.2.6.9	Integer	RO	Estimated average interval between error second events during evaluation process. The valid values are 1-2^31 where a value of -1 is used to indicate an undefined state.

Name	OID	Type	Access	Description
airmux400IduTdmSrvEval	1.3.6.1.4.1.4458.1000.2.6.10	Integer	RW	Evaluated TDM service bit mask. Setting this parameter to value that is bigger than the activated TDM service bit mask will execute the evaluation process for 30 seconds. Setting this parameter to 0 will stop the evaluation process immediately.
airmux400IduTdmBackupAvailableLinks	1.3.6.1.4.1.4458.1000.2.6.11	Integer	RO	Number of TDM backup trunks.
airmux400IduTdmBackupTable			N/A	IDU TDM Links Statistics table.
airmux400IduTdmBackupEntry			N/A	IDU TDM Links Statistics table entry.
airmux400IduTdmBackupIndex	1.3.6.1.4.1.4458.1000.2.6.12.1.1	Integer	RO	Table index.
airmux400IduTdmBackupMode	1.3.6.1.4.1.4458.1000.2.6.12.1.2	Integer	RW	TDM backup mode: Enable or Disable where the main link is the air link or the external link. Changes will be effective immediatly.
airmux400IduTdmBackupCurrentActiveLink	1.3.6.1.4.1.4458.1000.2.6.12.1.3	Integer	RO	TDM backup current active link: N/A air link is active or external link is active.
airmux400IduTdmJitterBufferSize	1.3.6.1.4.1.4458.1000.2.6.13	Integer	RW	TDM Jitter Buffer Size. The value must be between the minimum and the maximum TDM Jitter Buffer Size. The units are 0.1 x millisecond.
airmux400IduTdmJitterBufferDefaultSize	1.3.6.1.4.1.4458.1000.2.6.14	Integer	RO	TDM Jitter Buffer Default Size. The units are 0.1 x millisecond.
airmux400IduTdmJitterBufferMinSize	1.3.6.1.4.1.4458.1000.2.6.15	Integer	RO	TDM Jitter Buffer Minimum Size. The units are 0.1 x millisecond.
airmux400IduTdmJitterBufferMaxSize	1.3.6.1.4.1.4458.1000.2.6.16	Integer	RO	TDM Jitter Buffer Maximum Size. The units are 0.1 x millisecond.
airmux400IduTdmJitterBufferSizeEval	1.3.6.1.4.1.4458.1000.2.6.17	Integer	RW	TDM Jitter Buffer Size for evaluation. The value must be between the minimum and the maximum TDM Jitter Buffer Size. The units are 0.1 x millisecond.
airmux400IduTdmType	1.3.6.1.4.1.4458.1000.2.6.18	Integer	RW	TDM Type (The value undefined is read-only).
airmux400IduTdmTypeEval	1.3.6.1.4.1.4458.1000.2.6.19	Integer	RW	TDM Type for evaluation.
airmux400IduTdmLineStatusStr			RO	Line status.
airmux400GeneralTrapDescription	1.3.6.1.4.1.4458.1000.100.1	DisplayString	RO	Trap's Description. Used for Trap parameters.
airmux400GeneralTrapSeverity	1.3.6.1.4.1.4458.1000.100.2	Integer	RO	Trap's Severity. Used for Trap parameters.

Name	OID	Type	Access	Description
airmux400GeneralCookie	1.3.6.1.4.1.4458.1000.100.3	DisplayString	RW	Reserved for the Manager application provided with the product used for saving user preferences affecting ODU operation.
airmux400GeneralEcChangesCounter	1.3.6.1.4.1.4458.1000.100.4	Integer	RO	This counter is initialized to 0 after a device reset and is incremented upon each element constant write operation via SNMP or Telnet.

E.4 MIB Traps

Each ODU can be configured with up to 10 different trap destinations. When the link is operational, each ODU sends traps originating from both Site A and Site B.

The source IP address of the trap is the sending ODU. The trap originator can be identified by the trap Community string or by the trap description text. The public Community string is used for Site Al ODU traps and public-remote (as set by the user) is used for Site B ODU traps.

Each trap contains a trap description and additional relevant information such as alarm severity, interface index, time stamp and additional parameters.

Trap Parameters

Table E-3 lists the MIB traps.

Table E-3. MIB Traps

Name	ID	Severity	Description
trunkStateChanged	1	normal	Indicates a change in the state of one of the TDM trunks. Raised by both sides of the link. Contains 3 parameters: 1 - Description: TDM Interface %n - %x. 2 - %n: Is the trunk number. 3 - %x: Is the alarm type and can be one of the following: Normal, AIS, LOS, Loopback.
linkUp	2	normal	Indicates that the radio link is up. Contains a single parameter, which is its description: 1 - Description: Radio Link - Sync on channel %n GHz. %n Is the channel frequency in GHz.
linkDown	3	critical	Indicates that the radio link is down. Contains a single parameter, which is its description: 1 - Description: Radio Link - Out of Sync. The reason is: %s. %s Is the reason.
detectIDU	4	normal	Indicates that the IDU was detected. Raised by both sides of the link. Contains a single parameter, which is its description: 1 - Description: IDU of Type %s was Detected. %s Is the type of the IDU.

Name	ID	Severity	Description
disconnectIDU	5	major	Indicates that the IDU was disconnected. Raised by both sides of the link. Contains a single parameter, which is its description: 1 - Description: IDU Disconnected.
mismatchIDU	6	major	Indicates a mismatch between the IDUs. Raised by the master only. Contains a single parameter, which is its description: 1 - Description: IDUs Mismatch: One Side is %s and the Other is %s. %s Is the type of the IDU.
openedServices	7	normal	Indicates that services were opened. Raised by the master only. Contains 3 parameters: 1 - Description: %n2 out of %n1 Requested TDM Trunks have been Opened. 2 - %n1: Is the requested number of TDM truncks. 3 - %n2: Is the actual number of TDM trunks that were opened.
closedServices	8	normal	Indicates that services were closed. Raised by the master only. Contains a single parameter, which is its description: 1 - Description: TDM Service has been closed. The reason is: %s. %s Is the reason.
incompatibleODUs	9	critical	Indicates that the ODUs are incompatible. Contains a single parameter, which is its description: 1 - Description: Incompatible ODUs.
incompatibleIDUs	10	major	Indicates that the IDUs are incompatible. Contains a single parameter, which is its description: 1 - Description: Incompatible IDUs.
incompatibleOduIdu	11	major	Indicates that the ODU and IDU are incompatible. Contains a single parameter, which is its description: 1 - Description: The IDU could not be loaded. The reason is: %s. %s Is the incompatibility type.
probingChannel	12	normal	Indicates that the ODU is monitoring radar activity. Contains a single parameter, which is its description: 1 - Description: Monitoring for radar activity on channel %n GHz. %n is the channel frequency in GHz.
radarDetected	13	normal	Indicates that radar activity was detected. Contains a single parameter, which is its description: 1 - Description: Radar activity was detected in %s, on channel %n GHz. %s Is the site name. %n Is the channel frequency in GHz.
transmittingOnChannel	14	normal	Indicates that the ODU is transmitting on channel. Contains a single parameter, which is its description: 1 - Description: Transmitting on channel %n GHz. %n Is the channel frequency in GHz.
scanningChannels	15	normal	Indicates that the ODU is scanning channels. Contains a single parameter, which is its description: 1 - Description: Channel scanning in progress.

Name	ID	Severity	Description
incompatiblePartner	16	critical	Indicates that configuration problem was detected and that link installation is required to fix it. Contains a single parameter, which is its description: 1 - Description: Configuration problem detected. Link installation required.
timeClockSet	17	normal	Indicates that the ODU time clock was set. Contains a single parameter, which is its description: 1 - Description: The time was set to: %p. %p Is the date and time.
configurationChanged	18	normal	Indicates that the ODU was recovered from an error, but there are configuration changes. Contains two parameters: 1 - Description: Configuration changed. Error code is: %n. 2 - %n number.
hssOpStateChangedToINU	19	normal	Indicates that the HSS operating state was changed to INU type. Contains a single parameter, which is its description: 1 - Description: HSS operating state was changed to: INU.
hssOpStateChangedToHSM	20	normal	Indicates that the HSS operating state was changed to HSM type. Contains a single parameter, which is its description: 1 - Description: HSS operating state was changed to: HSM.
hssOpStateChangedToHSC	21	normal	Indicates that the HSS operating state was changed to HSC type. Contains a single parameter, which is its description: 1 - Description: HSS operating state was changed to: HSC_DT/HSC_CT.
vlanModeActive	22	normal	Indicates to non-VLAN PC that after 2 minutes the system will support only VLAN tag on management interface. Contains a single parameter, which is its description: 1 - Description: VLAN Mode is active. Non-VLAN traffic will be blocked in 2 minutes.
tdmServiceAlarm	100	major	Indicates that TDM Service is in alarm state. Contains a single parameter, which is its description: 1 - Description: TDM Service - Alarm.
ethServiceClosed	101	major	Indicates that Ethernet Service is closed. Contains a single parameter, which is its description: 1 - Description: Ethernet Service is closed.
ethServiceNotPermitted	102	major	Indicates that Ethernet Service is not permitted. Contains a single parameter, which is its description: 1 - Description: A valid Idu could not be detected at %s. Please check your configuration. %s - Is the Local Site name or Remote Site name or both sides of the Link.
encryptionAlarm	103	major	Indicates an encryption key mismatch. Contains a single parameter which is its description: 1 - Description: Encryption Status - Failed. No Services are available.

Name	ID	Severity	Description
changeLinkPasswordAlarm	104	major	Indicates that a failure has occurred while attempting to change the Link Password. Contains a single parameter which is its description: 1 - Description: Failed to change the Link Password at/on: %s. %s - Is the Local Site name or Remote Site name or both sides of the Link.
externalAlarmInPort1Alarm	105	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #1. Contains a single parameter which is its description: 1 - Description: External Alarm 1 - <User Text> - Alarm.
externalAlarmInPort2Alarm	106	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #2. Contains a single parameter which is its description: 1 - Description: External Alarm 2 - <User Text> - Alarm.
bitFailedAlarm	107	critical	The trap is sent in case there is no way to recover from the situation. Contains two parameters: 1 - Description: ODU power up built in test failed. Error code is: %n. 2 - %n number.
wrongConfigurationLoadedAlarm	108	major	The trap is sent in case there is a way to recover from the situation. Contains two parameters: 1 - Description: Wrong configuration loaded. Error code is: %n. 2 - %n number.
lanPort1DisconnectedAlarm	109	major	Indicates the LAN port 1 status changed to disconnected. Contains a single parameter which is its description: 1 - Description: LAN port 1 status changed to disconnected.
lanPort2DisconnectedAlarm	110	major	Indicates the LAN port 2 status changed to disconnected. Contains a single parameter which is its description: 1 - Description: LAN port 2 status changed to disconnected.
mngPortDisconnectedAlarm	111	major	Indicates the management port status changed to disconnected. Contains a single parameter which is its description: 1 - Description: Management port status changed to disconnected.
externalAlarmInPort3Alarm	112	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #3. Contains a single parameter which is its description: 1 - Description: External Alarm 3 - <User Text> - Alarm.
externalAlarmInPort4Alarm	113	major	The trap is sent every time an alarm occurs in the External Alarm Input of port #4. Contains a single parameter which is its description: 1 - Description: External Alarm 4 - <User Text> - Alarm.
swVersionsMismatchFullCompatibilityAlarm	114	warning	The trap is sent in case SW versions mismatch with full link functionality. Contains a single parameter which is its description: 1 - Description: Software versions mismatch - full link functionality
swVersionsMismatchRestrictedCompatibilityAlarm	115	minor	The trap is sent in case SW versions mismatch with restricted link functionality. Contains a single parameter which is its description: 1 - Description: Software versions mismatch - restricted link functionality

Name	ID	Severity	Description
swVersionsMismatchSoftwareUpgradeRequired	116	major	The trap is sent in case SW versions mismatch and SW upgrade is required. Contains a single parameter which is its description: 1 - Description: Software versions mismatch - Software upgrade required
swVersionsIncompatible	117	critical	The trap is sent in case SW versions are incompatible. Contains a single parameter which is its description: 1 - Description: SW Versions incompatible
hssMultipleSourcesDetectedAlarm	118	major	Indicates that multiple sync pulse sources were detected. Contains a single parameter which is its description: 1 - Description: HSS multiple sync sources were detected.
hssSyncToProperSourceStoppedAlarm	119	major	Indicates that synchronization to a proper sync pulse source was stopped. Contains a single parameter which is its description: 1 - Description: HSS sync pulse - Down. The_reason_is: %s. %s - Is the reason for the sync down.
hssSyncPulseDetectedAlarm	120	major	Indicates that HSS additional sync pulse was detected. Contains a single parameter, which is its description: 1 - Description: HSS additional sync pulse was detected.
tdmBackupAlarm	121	major	Indicates that the TDM backup link was activated. Contains a single parameter, which is its description: 1 - Description: TDM backup alarm - backup link was activated.
linkLockUnautorizedRemoteODU	122	major	Indicates that the remote ODU is unautorized. Contains a single parameter which is its description: 1 - Description: Unauthorized remote ODU connection rejected.
linkLockUnautorizedODU	123	major	Indicates that the ODU is unautorized. Contains a single parameter which is its description: 1 - Description: Unauthorized ODU connection rejected.
tdmServiceClear	200	normal	Indicates that TDM Service fault is cleared. Contains a single parameter, which is its description: 1 - Description: TDM Service - Normal.
ethServiceOpened	201	normal	Indicates that Ethernet Service has been opened. Contains a single parameter,3 which is its description: 1 - Description: Ethernet Service has been opened.
encryptionClear	203	normal	Indicates that encryption is OK. Contains a single parameter which is its description: 1 - Description: Encryption Status - Normal.
changeLinkPasswordClear	204	normal	Indicates that the Link Password was changed successfully. Contains a single parameter which is its description: 1 - Description: Link Password has been changed at/on: %s. %s - Is the Local Site name or Remote Site name or both sides of the Link.

Name	ID	Severity	Description
externalAlarmInPort1Clear	204	normal	This Trap is sent every time an External Alarm Input fault of port # 1 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 1 - <User Text> - Alarm Cleared.
externalAlarmInPort2Clear	206	normal	This Trap is sent every time an External Alarm Input fault of port # 2 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 2 - <User Text> - Alarm Cleared.
lanPort1Clear	209	normal	Indicates the LAN port 1 status changed to connected. Contains two parameters: 1 - Description: LAN port 1 status changed to connected - %s. 2 - %s Is the Eth. mode (speed & duplex).
lanPort2Clear	210	normal	Indicates the LAN port 2 status changed to connected. Contains two parameters: 1 - Description: LAN port 2 status changed to connected - %s. 2 - %s Is the Eth. mode (speed & duplex).
mngPort2Clear	211	normal	Indicates the management port status changed to connected. Contains two parameters: 1 - Description: Management port status changed to connected - %s. 2 - %s Is the Eth. mode (speed & duplex).
externalAlarmInPort3Clear	211	normal	This Trap is sent every time an External Alarm Input fault of port # 3 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 3 - <User Text> - Alarm Cleared.
externalAlarmInPort4Clear	213	normal	This Trap is sent every time an External Alarm Input fault of port # 4 is cleared. Contains a single parameter which is its description: 1 - Description: External Alarm 4 - <User Text> - Alarm Cleared.
swVersionsMatchFullCompatibilityClear	214	normal	The trap is sent in case SW versions match. Contains a single parameter which is its description: 1 - Description: Software Versions compatible
swVersionsMatchRestrictedCompatibilityClear	215	normal	The trap is sent in case SW versions match and link functionality is not restricted. Contains a single parameter which is its description: 1 - Description: Software Versions compatible
swVersionsMatchSoftwareUpgradeRequiredClear	216	normal	The trap is sent in case SW versions match and SW upgrade is successful. Contains a single parameter which is its description: 1 - Description: Software Versions compatible
swVersionsCompatibleClear	217	normal	The trap is sent in case SW versions compatible Contains a single parameter which is its description: 1 - Description: Software Versions compatible
hssMultipleSourcesDisappearedClear	218	normal	Indicates that multiple sync pulse sources disappeared. Contains a single parameter which is its description: 1 - Description: HSS multiple sync pulse sources disappeared.

Name	ID	Severity	Description
hssSyncToProperSourceAchievedClear	219	normal	Indicates that synchronization to a proper Sync source was achieved. Contains a single parameter which is its description: 1 - Description: HSS sync pulse - Up.
hssSyncPulseDisappearedClear	220	normal	Indicates that HSS additional sync pulse disappeared. Contains a single parameter, which is its description: 1 - Description: HSS additional sync pulse was disappeared.
tdmBackupClear	221	normal	
linkLockAutorizedODU	223	normal	Indicates that the ODU is authorized. Contains a single parameter which is its description: 1 - Description: Authorized ODU connection permitted.
linkAuthenticationDisabled	224	normal	Indicates that the Link Lock is disabled. Contains a single parameter which is its description: 1 - Description: Link Authentication has been disabled

Airmux Manager Traps

The Airmux Manager application issues traps to indicate various events. These traps are shown in the Airmux Manager event log.

A list of trap messages as displayed by the Airmux Manager is shown in *Chapter 5*.

Appendix F
Combo Tool

Airmux-400 is supplied preconfigured to a default frequency band and regulation. The user may however, reconfigure it to use any one of the supported frequency bands shown in the following example:

Product	Default Band	Additional Bands by Reconfiguration
AirMux-400/ODU/F5xFC/INT/50M	FCC/IC 5.8 GHz	Universal 5.4 GHz Universal 5.3 GHz Universal 4.9 GHz

The Combo Configuration Tool is a software utility supplied by RAD to change the link frequency band. It runs as a Windows wizard.

This appendix will walk you through the wizard. It also provides help for common problems encountered during the configuration.

Note *It is the user's responsibility to operate the system according to local regulations and to acquire the relevant permits or licenses for the frequency band selected, if applicable.*

F.1 Prerequisites

To use the tool, you need a PC running Windows 2000 or Windows XP Pro to be connected to the Airmux-400.

Before starting:

1. Obtain the IP address of both the local ODU and remote ODUs of the link
2. Make a note of the correct required frequency band
3. If the link uses external antennas, ensure that they support your required frequency band

Also, note that:

- The procedure below must be carried out for both ODUs in the link.
- Changing the frequency band may affect the available Link Budget and system performance.

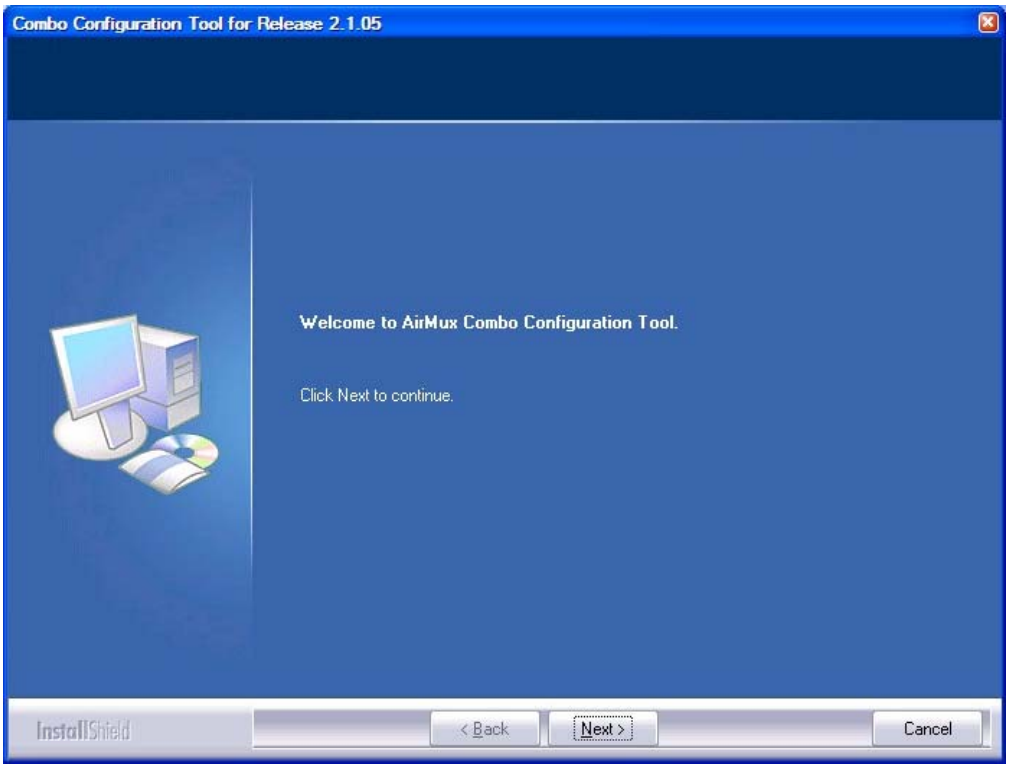
F.2 Operating the Combo Configuration Tool

The tool is supplied as an executable called ComboConfigurationTool.exe. It should be copied to a convenient directory on a hard disk from where it can be run from a command line, or placed on the desktop and opened with a double click.

The Combo Configuration Tool is a wizard, which guides you through the process of changing the frequency band.

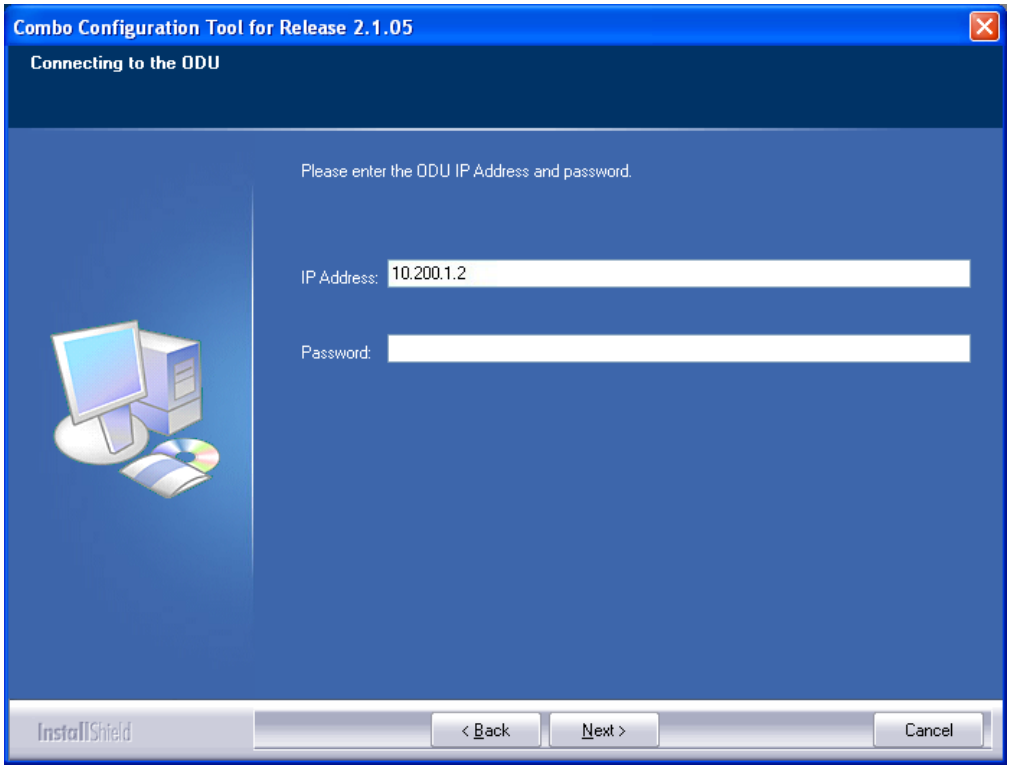
➤ **To change the link frequency band:**

1. Open the Tool from a command line or double clicking it on the desktop. The following Welcome screen appears:



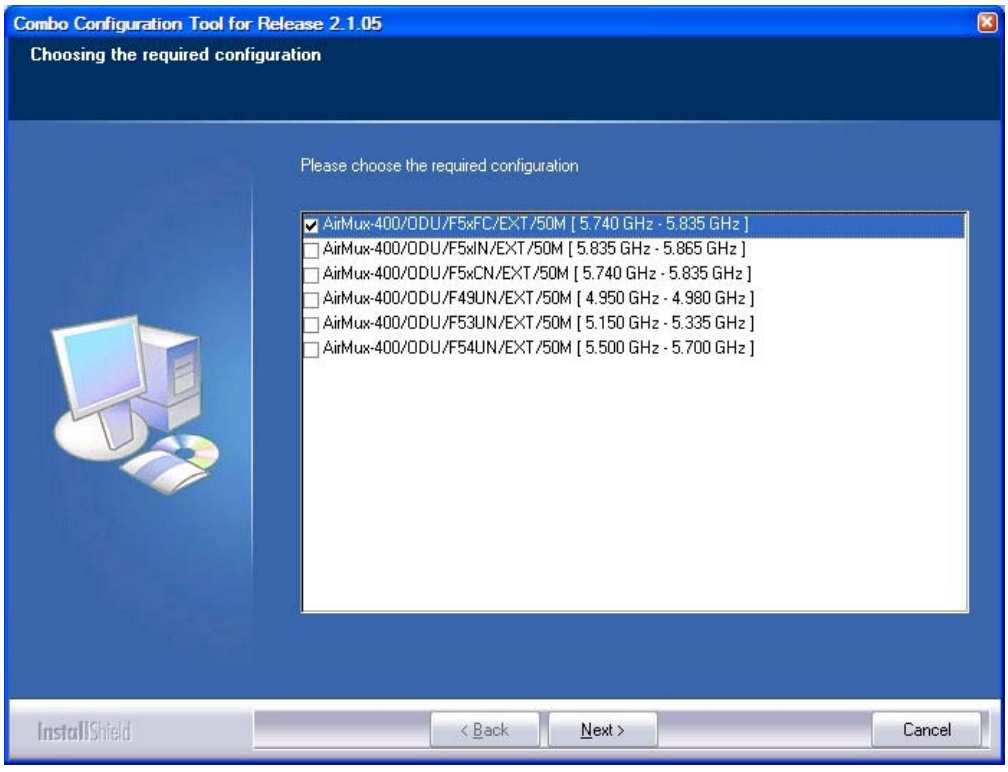
2. Click Next.

   The window below is displayed:

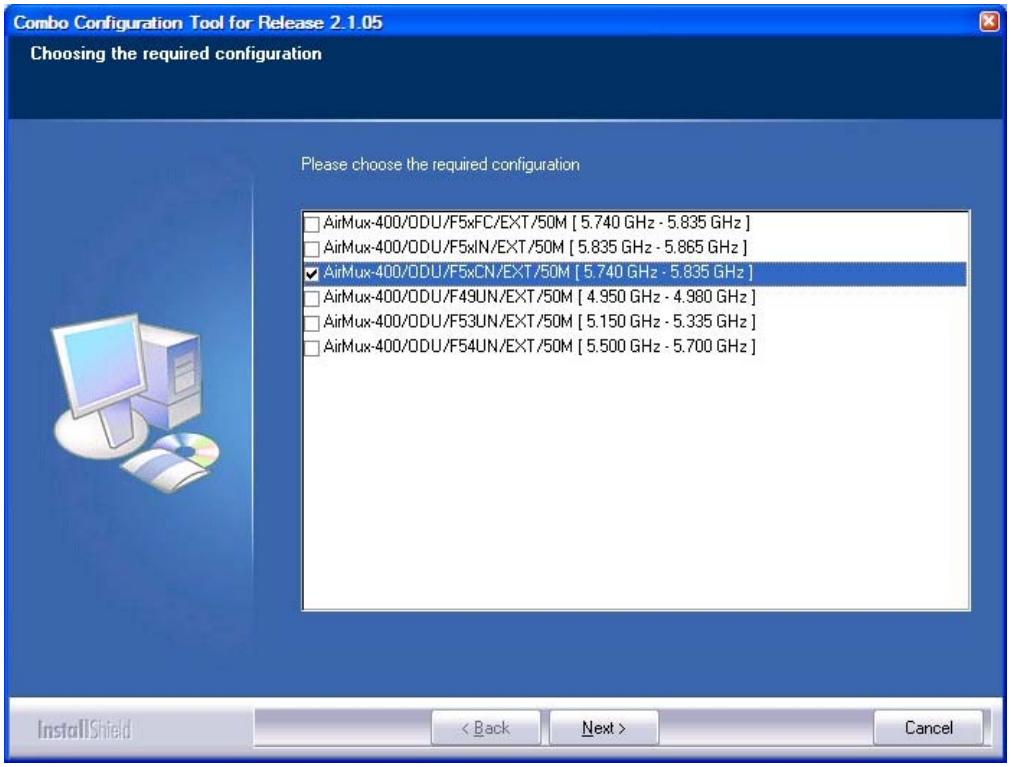


3. Enter the ODU IP address and password.
4. Click Next.

   The progress panel is displayed.
   Upon completion the frequency band screen is displayed. The checked item is the currently configured frequency band.

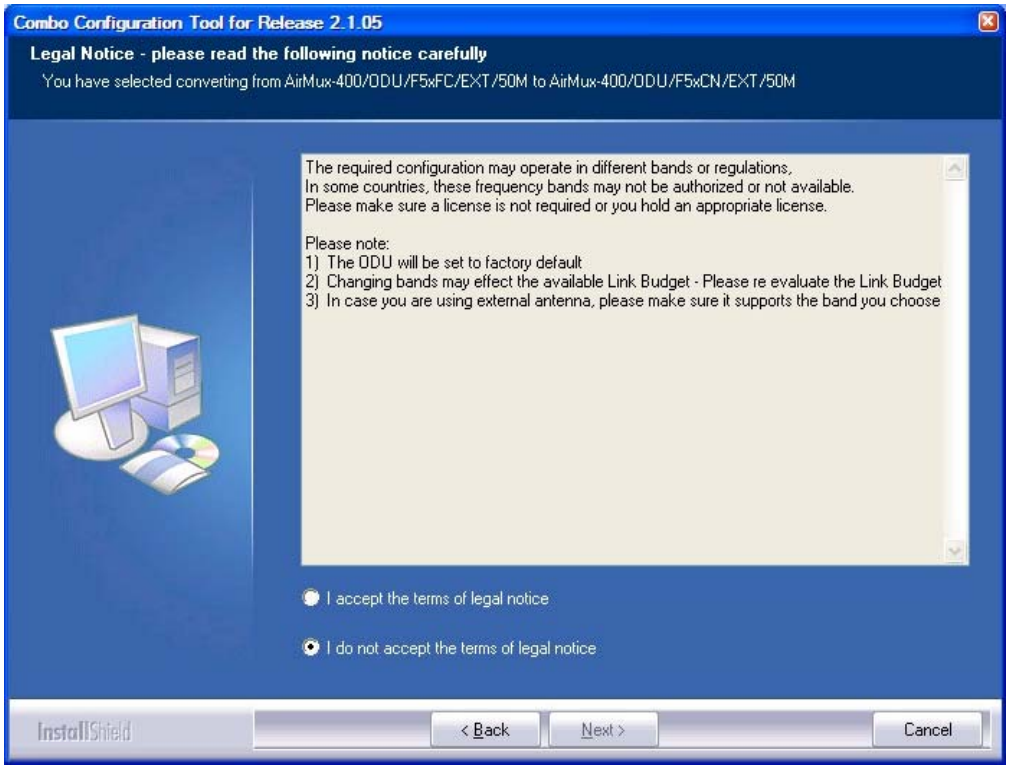

Combo Configuration Tool for Release 2.1.05
Choosing the required configuration
Please choose the required configuration
AirMux-400/ODU/F5xFC/EXT/50M [5.740 GHz - 5.835 GHz]
AirMux-400/ODU/F5xIN/EXT/50M [5.835 GHz - 5.865 GHz]
AirMux-400/ODU/F5xCN/EXT/50M [5.740 GHz - 5.835 GHz]
AirMux-400/ODU/F49UN/EXT/50M [4.950 GHz - 4.980 GHz]
AirMux-400/ODU/F53UN/EXT/50M [5.150 GHz - 5.335 GHz]
AirMux-400/ODU/F54UN/EXT/50M [5.500 GHz - 5.700 GHz]
InstallShield
< Back
Next >
Cancel

5. Check the box with the required frequency band. If you do not see the required frequency band in the above window, click **Cancel** and consult RAD Customer Support.


Combo Configuration Tool for Release 2.1.05
Choosing the required configuration
Please choose the required configuration
AirMux-400/ODU/F5xFC/EXT/50M [5.740 GHz - 5.835 GHz]
AirMux-400/ODU/F5xIN/EXT/50M [5.835 GHz - 5.865 GHz]
AirMux-400/ODU/F5xCN/EXT/50M [5.740 GHz - 5.835 GHz]
AirMux-400/ODU/F49UN/EXT/50M [4.950 GHz - 4.980 GHz]
AirMux-400/ODU/F53UN/EXT/50M [5.150 GHz - 5.335 GHz]
AirMux-400/ODU/F54UN/EXT/50M [5.500 GHz - 5.700 GHz]
InstallShield
< Back
Next >
Cancel

6. Otherwise, click **Next**.

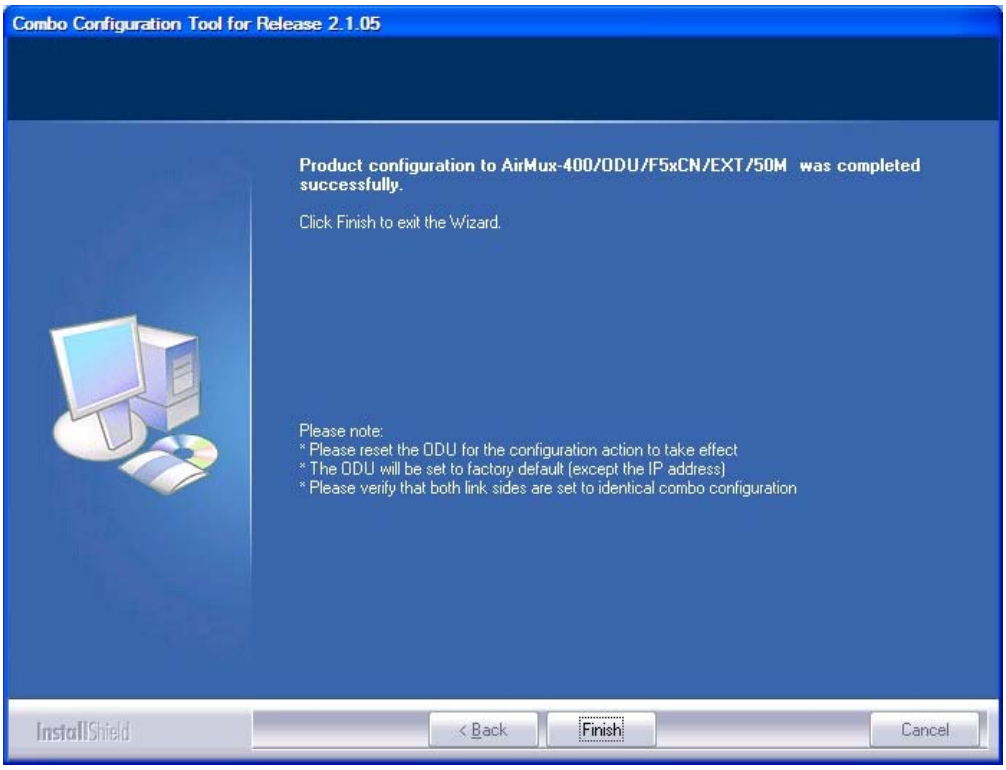
   The following window is displayed:


Combo Configuration Tool for Release 2.1.05
Legal Notice - please read the following notice carefully
You have selected converting from AirMux-400/ODU/F5xFC/EXT/50M to AirMux-400/ODU/F5xCN/EXT/50M
The required configuration may operate in different bands or regulations,
In some countries, these frequency bands may not be authorized or not available.
Please make sure a license is not required or you hold an appropriate license.
Please note:
1) The ODU will be set to factory default
2) Changing bands may effect the available Link Budget - Please re evaluate the Link Budget
3) In case you are using external antenna, please make sure it supports the band you choose
I accept the terms of legal notice
I do not accept the terms of legal notice
InstallShield
< Back
Next >
Cancel

7. If the legal notice is acceptable, click the "I accept" radio button, and then click Next.

   Two successive progress panels are displayed. The configuration may take several minutes.

   Upon successful completion of the configuration process, the following termination window is displayed:


Combo Configuration Tool for Release 2.1.05
Product configuration to AirMux-400/ODU/F5xCN/EXT/50M was completed successfully.
Click Finish to exit the Wizard.
Please note:
* Please reset the ODU for the configuration action to take effect
* The ODU will be set to factory default (except the IP address)
* Please verify that both link sides are set to identical combo configuration
InstallShield
< Back
Finish
Cancel

8. Click Finish to exit the Wizard as shown.
9. Repeat the whole process for the second ODU in the link.

F.3 Interpreting Error Messages

The last stage above may terminate unsuccessfully due to an error. Error messages are posted to a window like this:

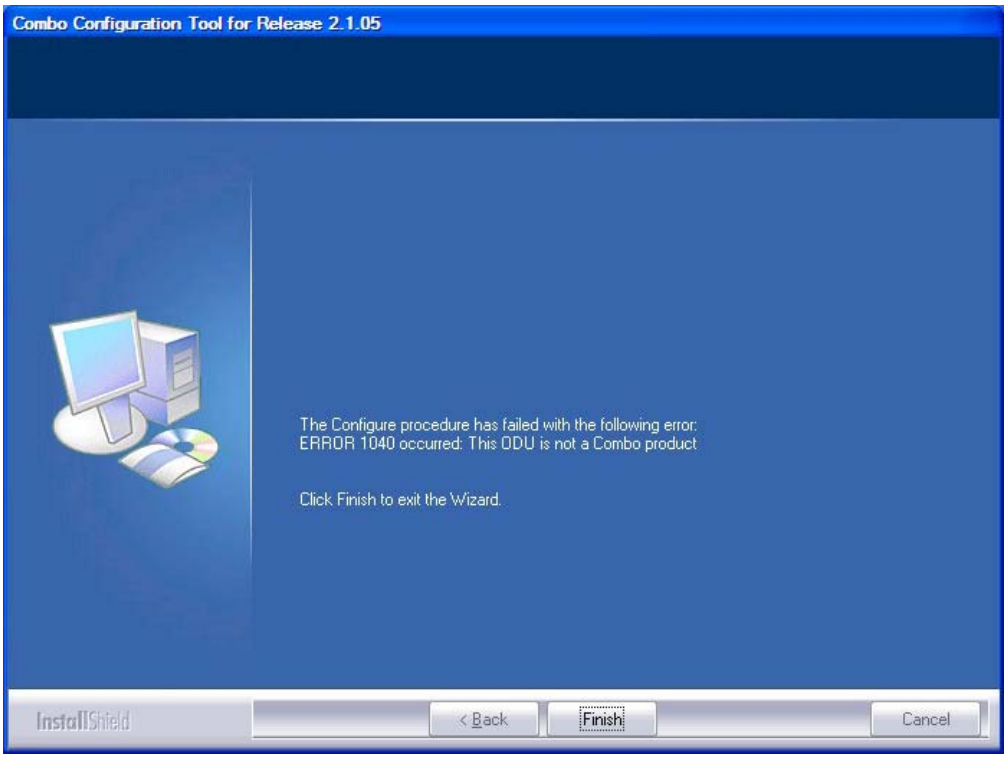

Combo Configuration Tool for Release 2.1.05
The Configure procedure has failed with the following error:
ERROR 1040 occurred: This ODU is not a Combo product
Click Finish to exit the Wizard.
InstallShield
< Back
Finish
Cancel

Table F-1. Error Messages

Error Number	Error Text Message
120	Failed to communicate with the ODU. Please verify the existence of a stable IP connection and try again.
940	Product is not identified.
1040	The ODU is not a combo product.
1020	A configuration problem detected. Aborting.

Error 940 may arise as a result of an ODU firmware problem. Error 1020 appears for any reason not caught by the other entries in the table.

RAD
data communications
The Access Company

24 Raoul Wallenberg Street, Tel Aviv 69719, Israel
Tel: +972-3-6458181, Fax +972-3-6483331, +972-3-6498250
E-mail: erika_y@rad.com, Web site: http://www.rad.com

Customer Response Form

RAD Data Communications would like your help in improving its product documentation. Please complete and return this form by mail or by fax or send us an e-mail with your comments.

Thank you for your assistance!

Manual Name: Airmux-400 Ver. 2.1

Publication Number: 581-200-11/08

Please grade the manual according to the following factors:

	Excellent	*Good*	*Fair*	*Poor*	*Very Poor*
Installation instructions	❒	❒	❒	❒	❒
Operating instructions	❒	❒	❒	❒	❒
Manual organization	❒	❒	❒	❒	❒
Illustrations	❒	❒	❒	❒	❒
The manual as a whole	❒	❒	❒	❒	❒

What did you like about the manual?

_____

_____

_____

_____

Error Report

Type of error(s) or problem(s):

- ❒ Incompatibility with product
- ❒ Difficulty in understanding text
- ❒ Regulatory information (Safety, Compliance, Warnings, etc.)
- ❒ Difficulty in finding needed information
- ❒ Missing information
- ❒ Illogical flow of information
- ❒ Style (spelling, grammar, references, etc.)
- ❒ Appearance
- ❒ Other _____

Please list the exact page numbers with the error(s), detail the errors you found (information missing, unclear or inadequately explained, etc.) and attach the page to your fax, if necessary.

_____

_____

_____

_____

Please add any comments or suggestions you may have.

_____

_____

_____

You are:

- ❒ Distributor
- ❒ End user
- ❒ VAR
- ❒ Other

Who is your distributor? _____

Your name and company: _____

Job title: _____

Address: _____

Direct telephone number and extension: _____

Fax number: _____

E-mail: _____

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International Headquarters

24 Raoul Wallenberg Street
Tel Aviv 69719, Israel
Tel. 972-3-6458181
Fax 972-3-6498250, 6474436
E-mail market@rad.com

North America Headquarters

900 Corporate Drive
Mahwah, NJ 07430, USA
Tel. 201-5291100
Toll free 1-800-4447234
Fax 201-5295777
E-mail market@radusa.com

www.rad.com

RAD
data communications
The Access Company